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for

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MATERIALS IN SHOES

BY

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VOLUME 3

CONSTITUTING PART OF THE TRAINING COURSE
FOR RETAIL SHOE SALESMEN

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PREFACE

THE purpose of this volume is to present facts of interest and importance concerning the materials used in the manufacture of shoes. The object has been to offer the retail shoe salesman information relating to shoe materials in their raw state, the sources of supply, the processes of manufacture employed to make them serviceable for their use in shoemaking, and the characteristics in appearance and wearing service of different kinds and qualities of materials as they are found in the finished shoe.

All this has for its object to broaden and deepen the salesman's knowledge of the goods he is selling and thus to increase the value of his service to his customer and finally to himself. The facts are based upon first-hand information from specialists, although no attempt has been made to present a technical treatise as a source of information for the expert in any branch of the wholesale trade.

Acknowledgment is made to the following experts who have generously contributed of their knowledge on subjects in their own special fields:

Charles Blair; J. C. Coffin; L. H. Gilson; E. W. Hurd; F. R. LeGallee; J. J. McPhillips; John Marshall; Edward O'Connor; C. U. Pifer; A. J. Ryan; F. H. Safford; F. W. A. Shultz; Fred H. Thompson; F. Harold Tolman; J. F. Wogan; F. W. Whitcher.

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MATERIALS IN SHOES

MATERIALS IN SHOES

CHAPTER I

DEMAND AND SUPPLY OF HIDES AND LEATHER

SALESMAN'S NEED TO KNOW LEATHER

The man (or woman) who sells shoes at retail needs first of all practical information that will enable him to advise customers regarding the different varieties and qualities of leather used in shoes. For unless he is well informed on the subject he is often likely to lose a sale because of his evident ignorance of leather. On the other hand, if he has a good knowledge of the various kinds of leather, their wearing qualities, preparation and proper use for different kinds of shoes and different parts of the same shoe, he has a great advantage over the salesman without such knowledge. After all, leather is the foundation of shoes and the quality and serviceability of the leather does more to determine the satisfaction of the customer than any other single factor.

WHAT LEATHER IS

Leather has held its place for ages as a thing apart and as a material that cannot be imitated with entirely satisfactory results. The reason for this is found in the natural formation of the

skins and hides of which leather is made. These are made up of fibres that are so related, either by interlacing or by their arrangement side by side, as to defy imitation by any man-made product. A close examination of the finished article shows these fibres and clearly explains the peculiar toughness, flexibility and wear-resistance so characteristic of leather. Illustrations are given to show the arrangement of fibres in different kinds of skins.

EARLIER USES OF LEATHER

For our purposes we are interested in knowing principally about leather as it is today and of its importance in the shoe trade. On the other hand, it is well to know something of how the present stage of development was brought about and of those who contributed to it all along the line.

The ancient Egyptian knew about the treatment of skins to make them serviceable for his use and to prevent their decay. An evidence of this fact is clearly shown, and may be seen today, from engravings on the stones of Egyptian tombs. These show, in a series of crude pictures, the various operations in the tanning process, as the ancient knew it.

Specimens of leather have been discovered in China, along with other antiques; and it has been proved that these are more than 3,000 years old. Coming down to more modern times,

comparatively speaking, the accounts of earliest explorations to America tell us definitely that the Indians were found to be using quite generally as part of their wearing apparel, if it may be so called, the skins of animals that had been treated with oil, clay or other substances as a means of preserving. In view of all this it is clear that leather at least, as a useful product, is not an "up-start."

SHOE LEATHER REQUIRES SPECIAL KINDS OF SKINS

The hides and skins of all animals, even including birds, reptiles and fishes, may be tanned into leather, but comparatively few kinds of skins are suitable for shoes. Likewise there are various kinds of plants containing tannic acid which will after a fashion change hides and skins into leather; but for practical purposes only a few of these sources of tannic acid can be used in making shoe leather.

Even considering the limited number of kinds of hides and tanning materials and the great care used in making each piece of leather so as to satisfy the requirements of certain parts of a shoe, it is impossible to make two pieces of leather exactly uniform. Leather is not a manufactured product in the sense that textiles are. Textiles are produced by combining the individual fibres which make up the fabric; leather, however, is grown on the backs of the animals.

The only job of the tanner is to preserve the hide or the skin from decomposition and to give it the desired solidity and hardness or flexibility and softness, according to the need for special purposes. It is for the tanner also to produce the desired color and finish. No two sides of sole leather or skins of calf or kid are alike and no tanner could make a good piece of leather out of a skin if it were below standard. Hides differ just as the faces and forms of human beings differ. For this reason, in spite of the utmost vigilance on the part of the tanner or manufacturer, shoes of the same make and price cannot be entirely uniform in the quality and substance of the upper and sole leather. But tanners and shoe-makers do grade the skins very carefully so as to get the leather as uniform as possible in shoes of each grade.

HIDES, KIPS AND SKINS CLASSIFIED

In general the term *hide* is used to represent the pelt of a full-grown animal. To come under this classification the pelt should weigh 25 pounds or more. *Kips* are the pelts of small or undersized animals of the cattle class. These usually weigh from 15 to 25 pounds. Originally the word came from the name of small native cattle of India, the pelts of which were used in England to a very considerable extent for shoe leather. The term *skin* is used in the leather trade to designate the pelt of smaller animals,

ILLUSTRATION TO SHOW RELATIVE PROPORTIONS
OF THE SKIN, KIP AND HIDE

such as the calf, sheep, goat and the like. These pelts generally weigh under 15 pounds.

In addition to the usual types of hides, kips and skins, which we shall describe, there are many others which are not suitable for shoes. The skins of birds, reptiles and fish are often used for fancy leather goods. As a result of the abnormal consumption of leather during the recent war period attempts have frequently been made to use the skins of sharks and larger fishes. It now seems doubtful if they will serve the purpose as they are too rough and hard for upper stock and the uneven skin surface prevents their use for sole leather. The skins of the whale, walrus and porpoise are quite elastic and if made into shoes would stretch almost indefinitely. For similar reasons, hog skins must be eliminated from the list of leathers. They are not only stretchy but also porous. It is possible, however, to use some of these and some other skins for innersoles. In other words, then, certain skins are suitable for shoes and others are not; depending upon the texture of the skin. For instance, in sheep skin the fibres are long and often weak so that the skin is unsuitable for any purpose where durability is essential.

The list below gives a fair idea of the variety of demands made upon leather for different purposes. Shoemaking ranks among the first of these requirements but the available supply must be apportioned among all these demands.

PRINCIPAL USES OF LEATHER

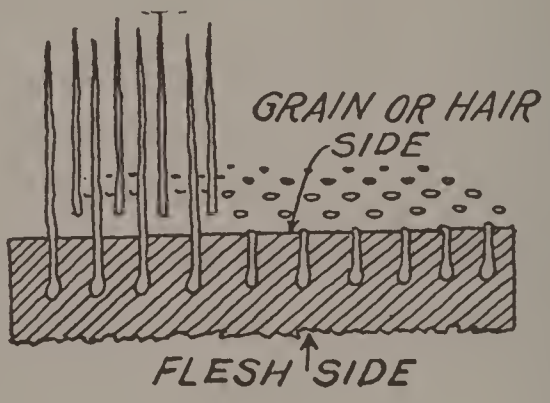
Automobile Upholstery Leather
Bag and Case Leather
Belting Leather
Bookbinders' Leather
Buffing Leather
Carriage Upholstery Leather
Clothing Leather
Furniture Leather
Glove Leather
Harness Leather
Pocket Book Leather
Shoe Leather (Upper)
Shoe Leather (Sole)
Shoe Leather (Findings)
Sporting Goods Leather
Strap Leather
Valve Leather
Whip Leather

DISTINGUISHING DIFFERENT KINDS OF LEATHER

The hides and skins of various animals can be studied readily in their raw state but it is not so easy to judge them after they have been tanned into leather. In fact, it is frequently difficult to tell one leather from another after it has been made into shoes, and sometimes expert leather buyers have difficulty to distinguish the leather. For the purpose of showing clearly the difference in the texture of skins of various animals, illustrations are given which represent enlarged sections of the skin as seen under the microscope. It is important to examine these carefully in order that the leather as used in the different kinds of shoes may be recognized.

In the raw state tanners technically distinguish hides according to the size, thickness, firmness and coarseness of the skin and by studying under a microscope the arrangement and size of the hair cells which appear on the *grain side*.

(The grain side of the hide is that side on which the hair of the animal has grown.) The question of sex is also a determining factor. In the bull hide there is a considerable item of waste in the fore part, at the animal's neck. Heavy wrinkles are conspicuous in this section of the hide



and these make it undesirable for the best usage. In the cow hide the neck makes a better grade of leather due to the absence of wrinkles. However, there are other portions of the hide, especially at the belly, that produce inferior leather. This is generally soft and stretchy and therefore not good for the best shoe making purposes. Hides from diseased animals are, of course, much inferior to those from healthy animals.

The skins of the heifer (young cow) and the steer (young ox) are finer in texture than those of the more mature animal. Also there are fewer of the soft and wrinkled portions that cause wastage in the larger hides. It is interesting to note that the variations in the quality of the leather in different parts of the hides are

so numerous that as many as twenty to thirty different grades of sole leather are often cut from one hide.

CATTLE HIDES

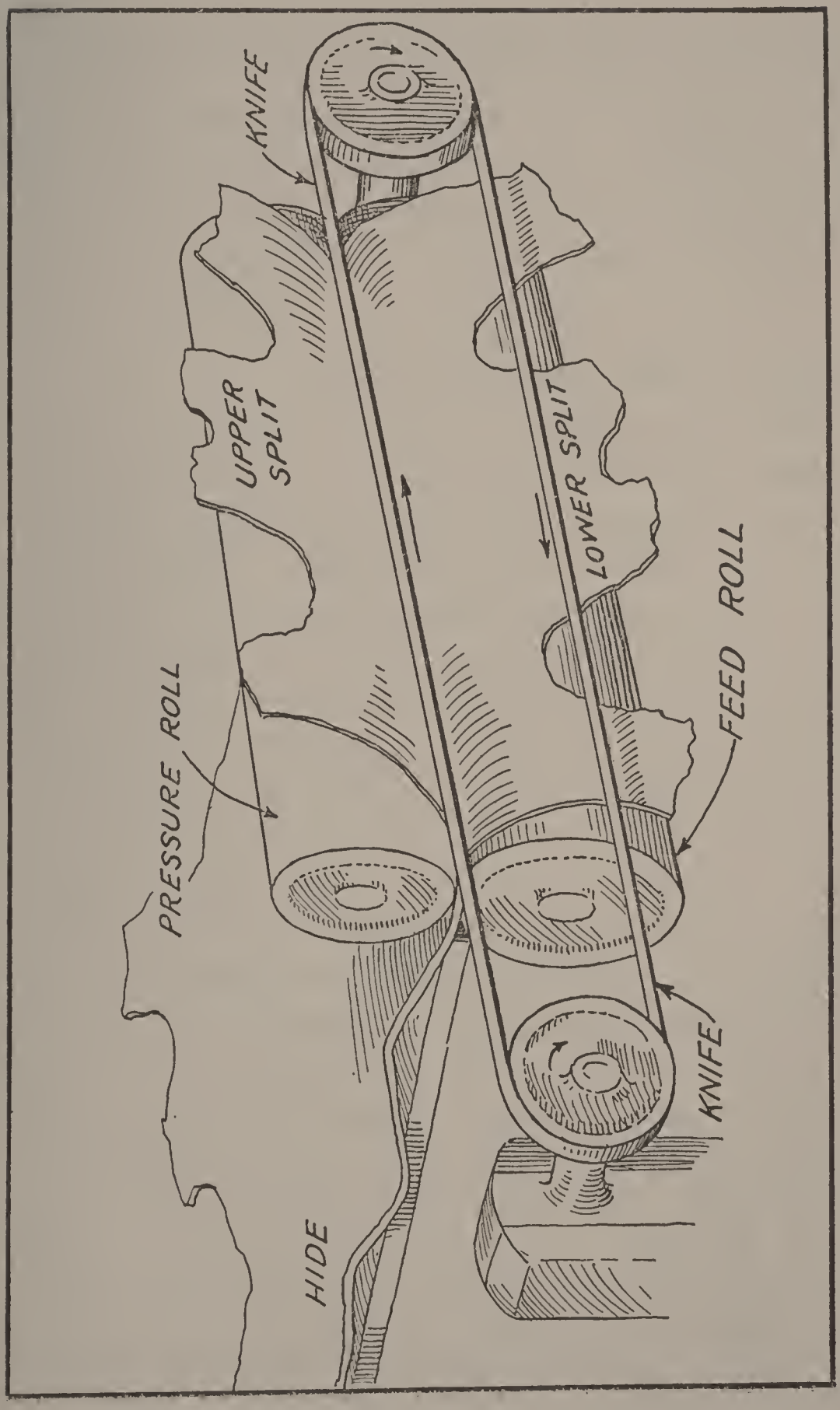
Cattle hides are divided into three classes — steers, cows and bulls. Domestic hides are *green salted*. This means that as soon as they are taken from the animal they are salted or put into brine to prevent decay until they are tanned. Imported hides come into this country either green salted or dried. Those from Buenos Aires, which is a very important South American point of export for hides, come to the markets of the United States both in the dry and green salted condition. Those from South American packers are green salted, the same as those from the local packers. Other hides that are gathered in smaller quantities from outlying sections of South America are received here dried; having been stretched on boards and dried in the sun before shipment. Some of the hides from the River Plata and from Australia come partly dried and salted on the flesh side. Others, particularly from Brazil and the West Indies, come in fully dried and salted. Cattle hides from the great beef packing houses in South America are known as *Frigerificoes* (refrigerator) and are the South American equivalent for the hides from the American packing houses.

EXTENT OF DEMAND FOR CATTLE HIDES

Although in the latter part of 1919 there were about 70,000,000 head of cattle in the United States, according to the best estimate, the annual slaughter does not yield anything like enough cattle hides. During the year 1915, before the imports were seriously restricted because of the European war, the receipt of cattle hides from foreign countries amounted to nearly 9,000,000 pieces weighing more than 300,000,000 pounds and costing over $61,000,000.

Steer and cow hides are used for automobile, furniture and belting leathers as well as for both upper and sole stock in shoes. Bull hides seldom go into anything except sole leather. Cow hides, if not marred on the surface by brand marks and the like, can be tanned and *split*. (The process of splitting is one of dividing by cutting through the thickness of the hide, thus producing two or more pieces of reduced thickness out of the original hide.) When this is done the splits from the grain side are used for upper leather while the splits from the flesh side may be used for a variety of purposes. For instance, they make very good, flexible innersoles and fairly good upper stock, when blackened and finished in imitation of calf skin. Of course, this leather is inferior and is only used in lower grade shoes.

Reference to the illustration of the splitting



SPLITTING PROCESS

process will show how splits are cut. The lower roll is made with a rough surface so as to hold down the lower split and also to feed the hide to the knife. The rolls are adjustable to different thicknesses of leather. The knife also is adjustable to give splits of varying thicknesses.

PACKER AND COUNTRY HIDES

Domestic hides are classified as *packer* and *country* hides. Packer hides, as their name indicates, come from the beef packing establishments, such as those of Chicago, Kansas City, St. Louis and other packing centers. Country hides are those gathered from the small country butchers and the farmers. Packer hides are much superior to the country hides because of the more expert manner in which the packers are able to remove the hide from the animal. There is less spoilage due to cuts and scores. Also there is a great amount of care exercised in selection and curing. Packer hides are dropped into the cellars directly from the slaughter house and are selected, sorted and graded at once. Tanners are enabled to buy from the big packers carload lots of any given selection and can be reasonably sure of getting uniform hides in the best possible condition. On the other hand, country hides are collected in small, scattering lots and frequently have begun to putrefy before they are properly salted. As a result packer

hides command a very much higher price than country hides.

HIDES FOR SOLE AND UPPER LEATHER DISTINGUISHED

In a previous section it has been noted that cattle hides are used mainly for sole leather. It is well to remember here that the requirements of leather for soles are quite different from those for the uppers. Sole leather must be very firm and dense, while upper leather must be flexible and of finer texture. Accordingly the hide industry and likewise the leather, as far as the use of skins for shoes is concerned, is sharply divided between hides for soles and leather that is intended for shoe uppers. In large shoe factories it is quite customary to have two leather buyers, one of whom gives his time to the purchase of sole leather and the other to upper leather.

Among the hides, those from the bull and steer are commonly used for sole leather while cow hides are used partly for sole leather and partly for upper leather. The smaller hides or kips, as they are called, are generally used for upper stock.

CALF

The most common, and in many respects the most suitable skin for making upper leather, is the calf skin. There is as much difference

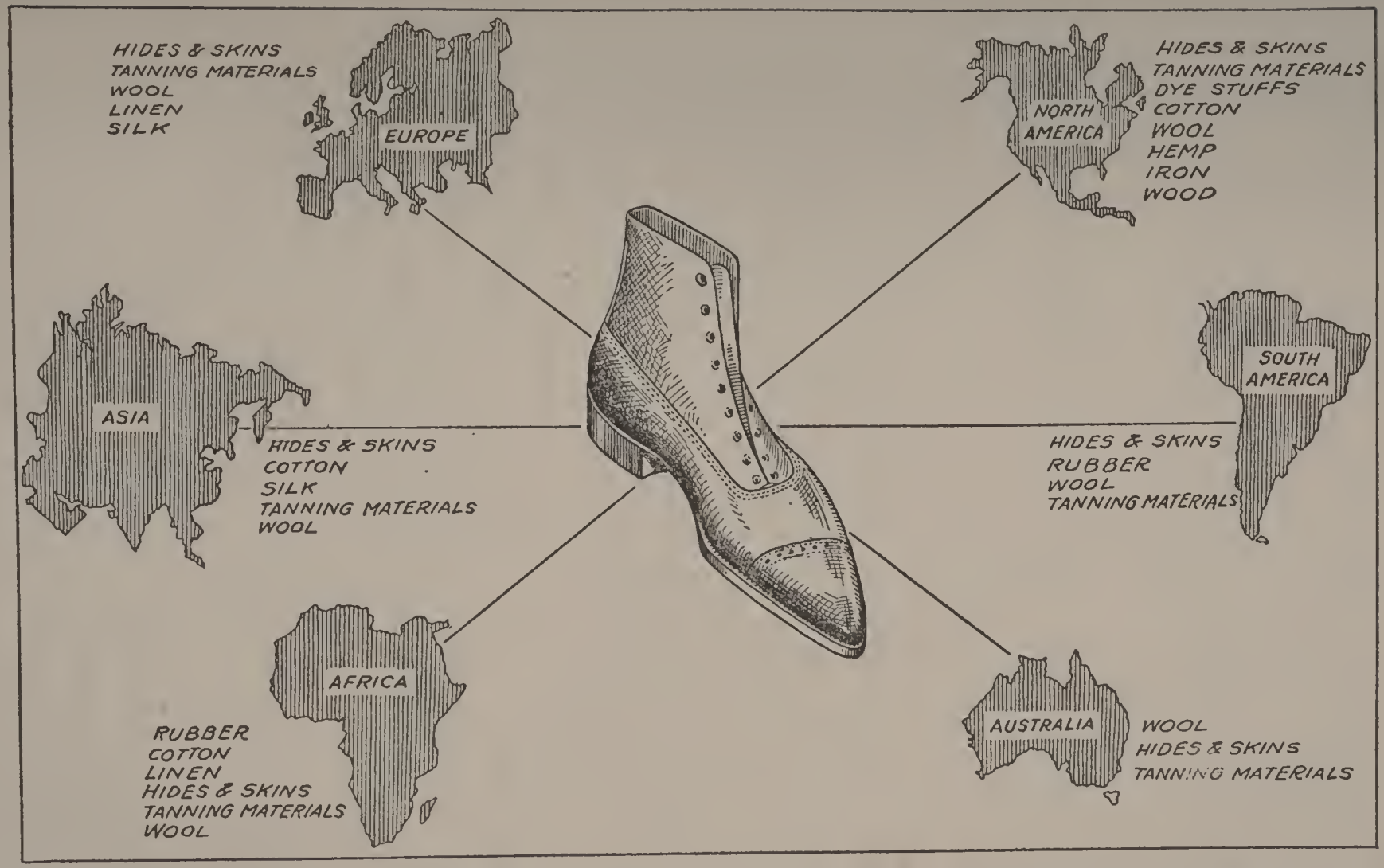
between calf skin and cow hide as there is between veal and beef. Calf skin is smaller, softer and finer and the grain is more even.

KIPS

Kips are really a class or variety of calf skin. They are taken off the larger calves that have become old enough to graze. However, such a skin is not so large as to require that it be cut into two sides, as is done in the case of the cow hide. Because of its greater size and weight the hide is separated into two parts by cutting it down the line of the back-bone, thus making it more convenient to handle in the tanning process. The kip has certain qualities of both hides and skins, being firmer than a skin but not so firm as a hide.

GOAT

The goat is the meat and dairy animal over a great part of the earth's surface. In Europe, Asia and Africa and parts of South America, herds of goats are so large and numerous that almost incredible numbers are slaughtered annually without danger of cutting off the future supply. The number of goats in America is very small. Goat skin is much more firm than sheep skin as the fibres in the former are interlaced instead of running parallel, as they do in the sheep skin. For this reason it will stand the strain in any direction. Therefore, leather



For you, along the Spanish main,
A hundred keels are ploughing;
For you, the Indian on the plain
His lasso-coil is throwing;

For you, deep glens with hemlock dark,
The woodsman's fire is lighting;
For you, upon the oak's grey bark
The woodsman's axe is smiting.

For you, from Carolina's pine
The rosin-gum is stealing;
For you, the dark-eyed Florentine
Her silken skein is reeling;

For you, the dizzy goat-herd roams
His rugged Alpine ledges;
For you, round all her shepherd homes
Bloom England's thorny hedges.

— *John Greenleaf Whittier*

made from goat skin, which is commonly called *kid,* makes an excellent upper leather. There are many varieties of goat skin, due to the various conditions in the different parts of the countries from which the animals come.

SHEEP

As will be inferred from the preceding paragraph, the sheep skin, because of the parallel arrangement of its fibres, is not as suitable for the making of leather as the goat skin or many other types of skins. The leather made from it, however, is suitable for facings, tongues and similar uses where the strain of pulling and twisting is not so great. Large quantities of sheep skins are tanned into leather for gloves and other purposes in which less strength or wearing quality is necessary.

CABRETTA

The cabretta is a cross between a sheep and a goat and therefore the skin is somewhat better than sheep skin and somewhat poorer than the goat skins. Cabretta leather is suitable for some of the lower grades of women's and children's shoes.

HORSE AND COLT

Certain portions of the horse or colt hide are suitable for upper leather; principally that from the front or forward portion of the hide. The

pelts are most commonly imported from Russia or South America. In the United States, as horse flesh is not generally eaten, as is the case in Russia and some of the countries in the eastern hemisphere, the only horse hides are those coming from the horses that die naturally or have to be killed because of accident and the like. This, however, is a very considerable number.

KANGAROO

The skin of this animal has been popular material for making upper leather, but in recent years the animal has become almost extinct, and the few skins now obtainable command a high price. As a factor in modern shoemaking the kangaroo skin is, therefore, practically of no consequence. The appearance of kangaroo skin is different from that of most other leathers used in shoe uppers. Instead of the usual grained effect it has a pitted surface, as though the skin had been impressed all over its surface with fine pin points.

DEER

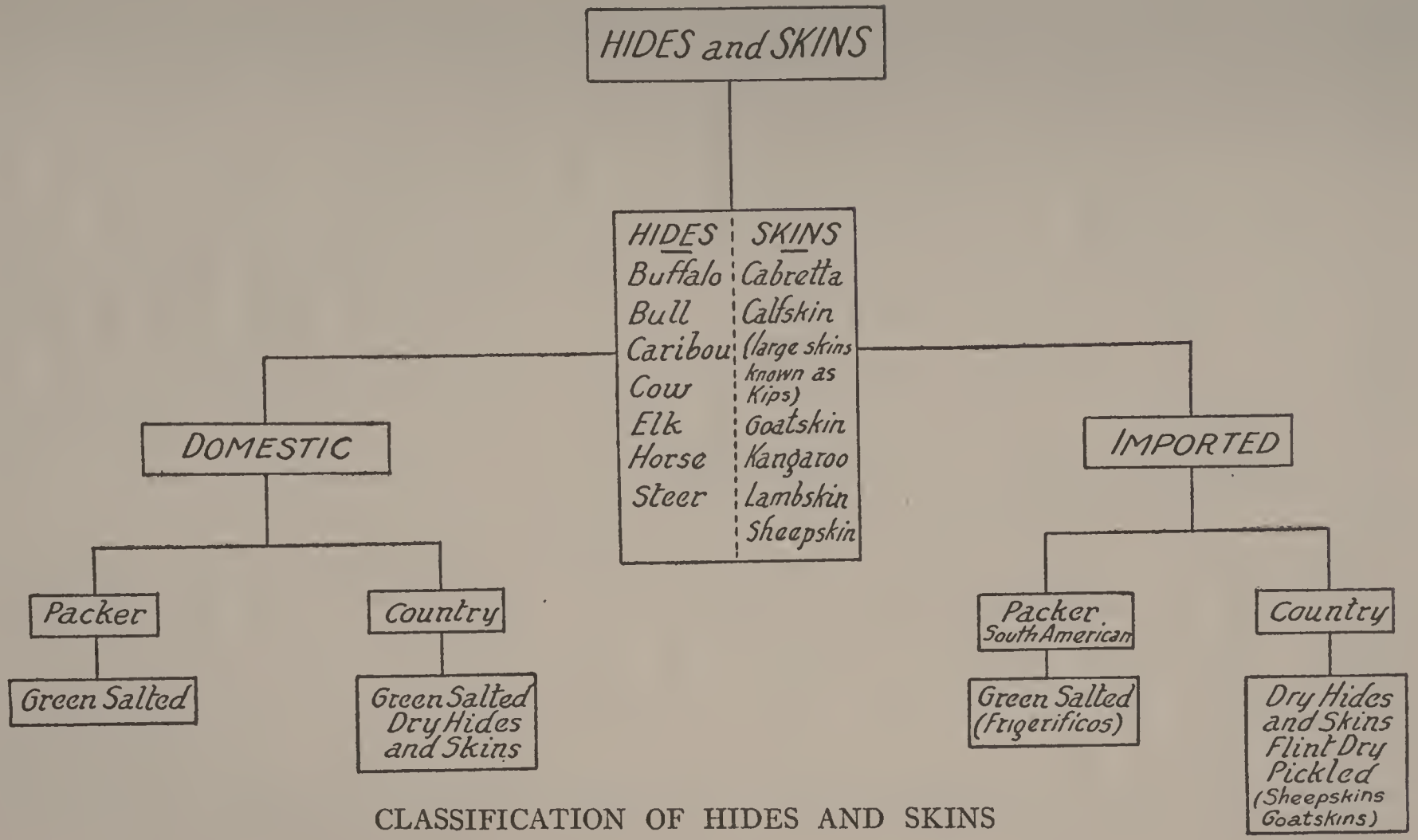
The skin of the deer makes a very satisfactory leather for the uppers of shoes but the quantity available is very limited. The skin commonly called *buckskin* was originally a deer skin. At the present time, however, the genuine deer skin is so difficult to obtain that

it is seldom seen. The so-called buckskin on the market today is generally a cattle or calf skin with a suede finish.

BUYING AND SELLING OF HIDES AND SKINS

Packer hides are sold almost exclusively from Chicago although the hides may originate and be shipped from branch packing houses in other cities. This makes Chicago the greatest market in the world for hides in the raw, salted state. These are known in the leather business as *green salted* hides. Hide quotations are made in Chicago every day and all other markets base their operations upon the Chicago quotations. The tanners, as a rule, buy through brokers, ordering several carloads at a time, often as many as ten or twenty. When one stops to consider, for example, that in the latter part of 1919 the price of a carload of packer hides was from $15,000 to $18,000, it will be understood that large amounts of money are needed to finance the leather industry.

Country hides are collected by wholesale dealers and are sorted and graded. In any case they are a scattering and unsatisfactory quantity. The same applies to calf and sheep skins. In recent years butchers have to a large extent been obliged by trade conditions to stop killing cattle, calves and sheep and to buy their dressed meats from the packers. In the aggregate, however, the country hide business is important. Com-



CLASSIFICATION OF HIDES AND SKINS

paratively speaking, the packers kill about 70 per cent and the country farmers and butchers about 30 per cent.

IMPORTATION OF SKINS

The proportion of skins imported from foreign countries continues to increase rapidly. During the period 1915-1917, which represents fairly normal conditions, about 50 per cent of the cattle hides used in the United States were domestic and only about 45 per cent of the calf skins were from animals raised here. In the case of skins of goats and kids, the proportion of those imported was actually 97 per cent. Normally, imports of hides and skins are between 5,000,000 and 6,000,000 pounds annually, valued at from $100,000,000 to $120,000,000.

HIGH COST AND SCARCITY OF HIDES AND SKINS

Although the great beef packers control a large percentage of the domestic supply of hides and skins they are not able to control completely the wholesale price of hides because of the fact that American tanners have access to the markets of the world and can import hides and skins free of duty. The country-wide campaign in 1909, after the election of President Taft, to restore hides and skins to the free list was not essentially a movement to make hides cheaper. During many years economic condi-

tions all over the world had been working to increase the demand beyond the supply. The tanners and shoe manufacturers realized that with all the commercial countries admitting hides and skins free into their ports the continuance of a tariff of fifteen per cent in the United States would enable the packers and dealers in domestic hides to demand prices 15 per cent above the world's level of values. Under normal conditions, and with no tariff on foreign hides, efforts to exact inordinate prices are defeated by the tanners purchasing increased quantities of foreign hides and skins. The resulting decrease in the demand for the domestic product automatically results in a decline to the standard of price as set by world competition.

The basic cause of high prices in the leather industry is the steadily increasing consumption of leather without a corresponding increase in the production of hides and skins. Greater demand does not create a greater supply of hides and skins, for the reason that they are incidental or by-products, resulting from the slaughter of animals for food. The per capita consumption of beef, mutton and veal has been decreased as a result of the introduction of cereal foods, the stocking of rivers and lakes with fishes, the scientific operation of poultry farms and the introduction of cold storage systems and refrigerator cars. As a result of all these things it is now possible to get along without the quanti-

ties of meat per person our ancestors thought necessary. When we consider that in addition to this state of reduced supply of leather each person now requires a greater number and variety of shoes, not to mention the many other demands upon the leather trade, such as that made by the automobile, it becomes apparent that economic conditions are responsible for the extreme cost of leather today as compared with prices a decade or more ago.

It may seem a far cry from these reflections about the economics of the hide and leather supply to the sale of shoes at retail. However, it should be remembered that in the campaign for free hides in 1909, in order to have the law changed so that hides might be imported without duty it became necessary to make the concession that shoes also be placed on the free list — where they have since remained. But this question is likely to recur at any time when a new revenue law is in process of legislation at Washington.

INFLUENCE OF WAR UPON HIDE AND SKIN SUPPLY

The effect of the European war upon the hide and skin supply and hence upon the quantity of leather available has already been felt to some extent. However, the full force of it will not be understood until after the adjustment to peace conditions is complete. Leather is one

of the most important munitions of modern warfare. It is used not only for soldiers' shoes but for harness and many kinds of military accoutrements and supplies.

As has been previously explained, the number of hides and skins produced in a given time is not determined by the demand for leather but by the number of animals slaughtered for food. The war, involving as it did, almost all the civilized nations, enormously increased the consumption of leather, but the supply was maintained also because of the coincident demand for meat to feed the armies. The slaughter of food animals increased tremendously, resulting in larger supplies of both flesh food and leather. There is every reason to suppose that the herds of cattle and sheep have been depleted to an extent that may threaten the future supply. It is reasonable to suppose that during these years of readjustment hides and skins will continue to be scarce and high in cost and that leather and shoes will have to be sold at rates far above the prices of a few years ago. A careful study of the leather situation will lead anyone to the conclusion that it is out of the question to expect a return to the low prices that formerly obtained.

PRICE MOVEMENTS

The following chart serves to show the general advance in prices of leather during the period

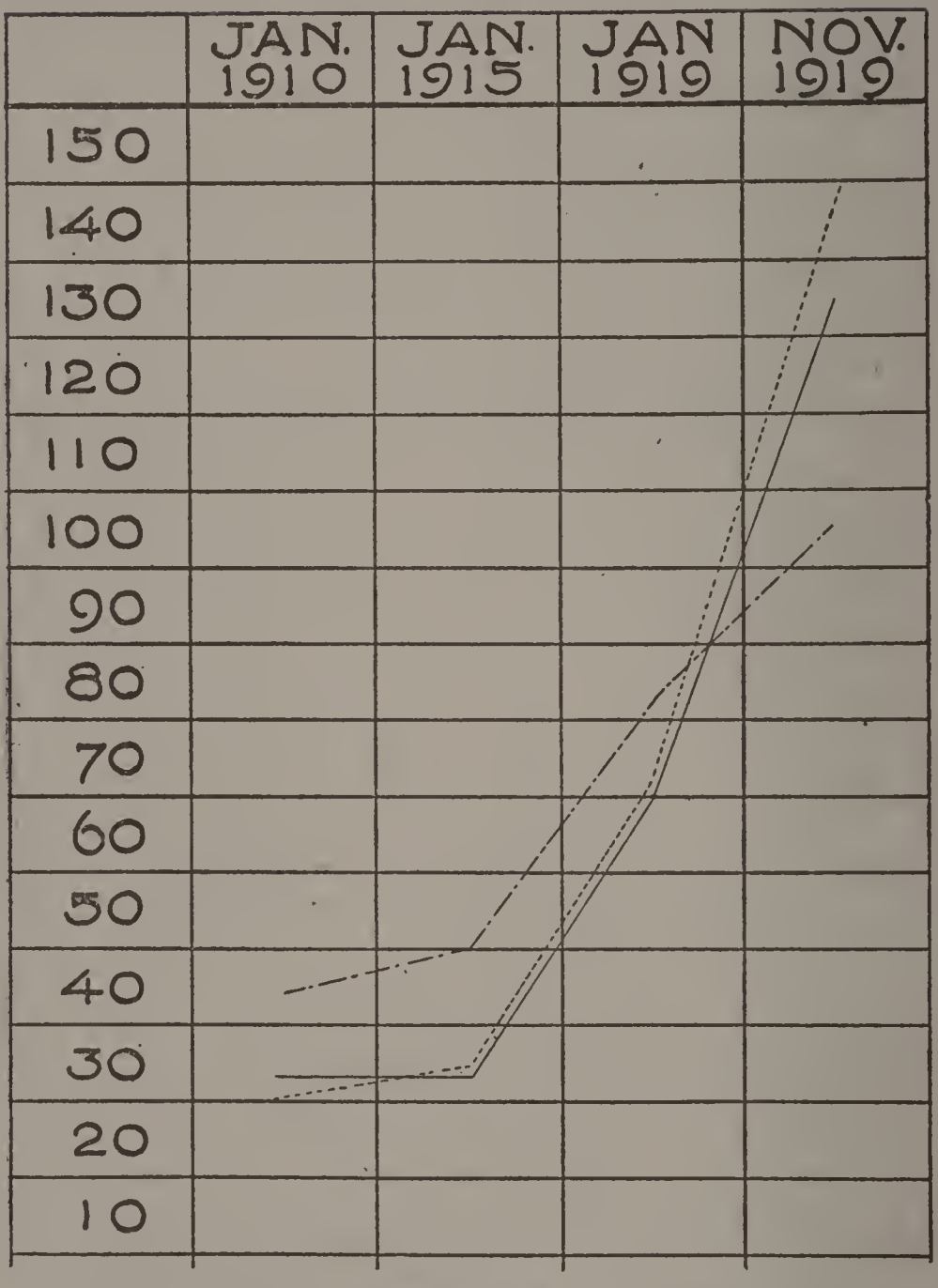


CHART-PRICES OF LEATHER

GLAZED KID, BLACK _____

CALFSKIN .....

SOLE LEATHER _._._._._._._._

1910 to 1919. For instance, the price of black glazed kid advanced from 33 cents per square foot in 1910 to $1.36 in November 1919; an increase of 312 per cent. Calfskin advanced from 30 cents to $1.50 per square foot during the same period. This represents an increase of 400 per cent. Sole leather, which is sold by the pound, jumped in price from 45 cents to $1.06, or 135 per cent. These figures bring out clearly one of the chief factors that have contributed toward the increase in the price of shoes today, as compared with the prices of a few years ago.

CHAPTER II

TANNING OF LEATHER

SOFTENING, CLEANING AND UNHAIRING

The preparation of the hides and skins for tanning depends first of all upon the condition in which they are received. If the pelts are green salted or fresh, as removed from the animal, the tanner can go ahead at once with the cleaning. If, however, they are dry it is necessary to soften them by soaking with water and by subjecting them to a process known as *milling*. The pelts, after having been thoroughly soaked, are placed into a revolving drum or mill. This process serves to soften up the pelt and to restore its original flexibility. The method originally employed in carrying out this process was that of rubbing the pelt by hand after it had been soaked. However, this method is no longer of any practical importance.

It is to be expected, of course, that when the hides and skins are received they are not sufficiently clean to be taken up in the first process of tanning. They are washed thoroughly, and, if necessary, scraped in order to remove any flesh or foreign matter.

The next process is that of removing the hair — known as *unhairing*. This consists of treating the pelts to a bath of caustic lime which causes the roots of the hair to loosen so that removal of the hair may be made by rubbing or by scraping with a knife. In the case of hides to be used for sole leather the liming is not carried far enough to soften the hide and dissolve the cement substance between the animal fibres. Sometimes instead of liming, the pelts are sweated in a closed room. In this process decomposition goes just far enough to loosen the hair roots. The hair is then removed either by scraping off by hand or by running the pelt through a special machine provided for that operation.

BATING OR PUERING

When the hair has been removed the skins are subjected to a process called *bating*. If lime were left in the skin the effect would be to retard the process of tanning and cause the leather to be harsh. In the early days it was discovered that manure, containing ammonia and other chemical properties, has a natural affinity for lime and this material was therefore used, and is today, as part of the tanning process to neutralize all traces of lime. The process is called bating or *puering*.

The pelts are put into a bath and the warm liquor is circulated. The action upon the skin

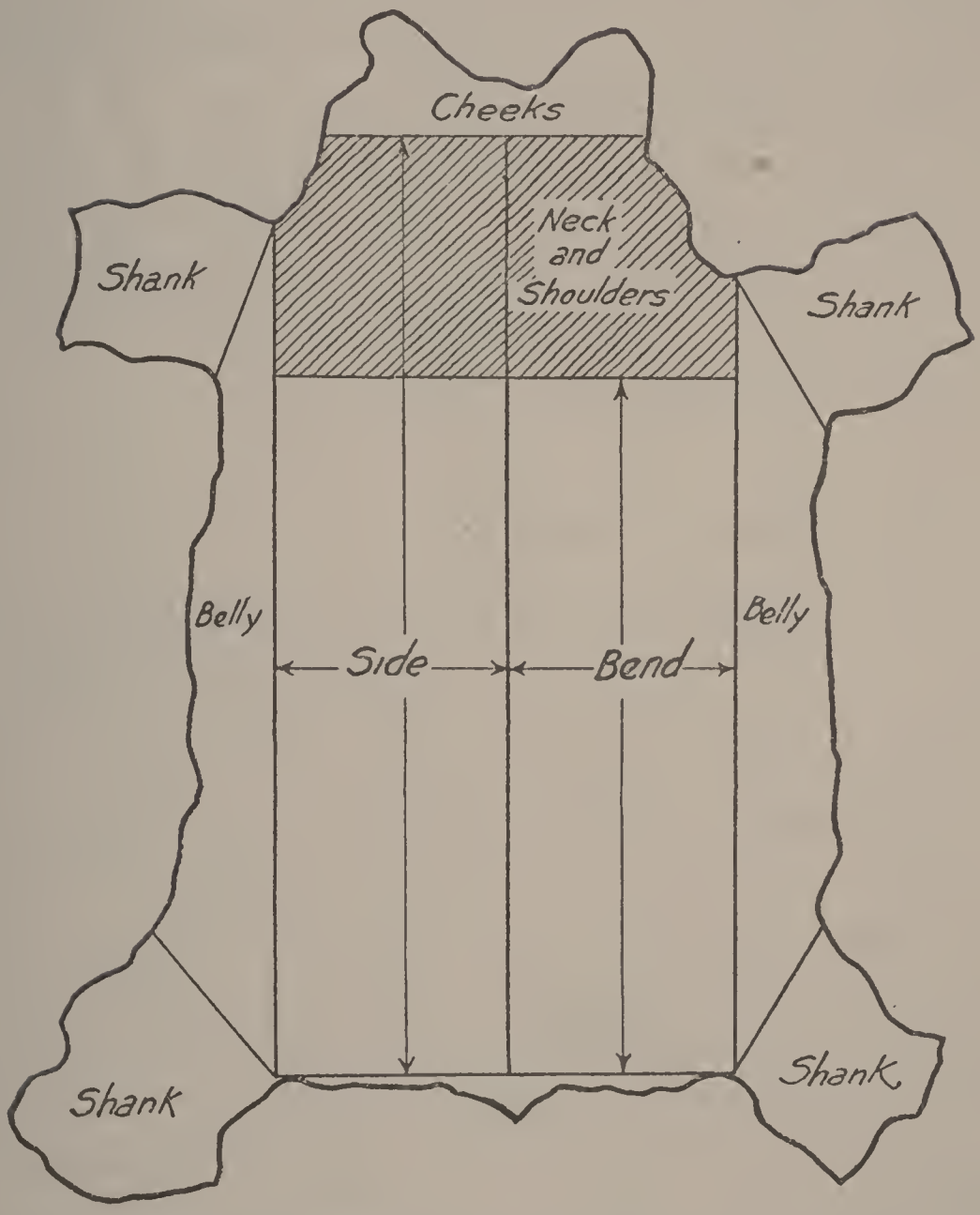
may be one either of fermenting, brought about with the use of bran and water, or it may be a bacteriological action. In the latter case a culture of bacteria is first prepared in a warm solution. When the skins are subjected to this, the germs or bacteria immediately operate to check the action that was originally caused in applying lime as part of the cleaning process.

Another action of the bacteria is that of opening the pores of the skin and of cleaning them so that they will be in a condition to receive the tanning liquor that is to be used in the next following process. In the bating process the skin is also freed of all superfluous gelatine.

IMPORTANCE OF BEAM HOUSE

With the advancement of the tanning industry and of the greatly increased demand for leather of all kinds and for all uses, tanners are now agreed that the quality of leather produced is largely dependent upon the care and skill given to it in the *beam house* process. This is the part of tanning in which the lime is taken out, and upon the success or failure of this depends a great deal of the success of leather.

In the case of the large hide it is necessary that it be cut into different parts, such as bends, sides, shoulders and the like, because each of these sections is to be used for different purposes and requires different methods of tanning. An illustration is given to show the several parts



SECTIONS INTO WHICH HIDES ARE CUT

into which hides are cut. The main part of the hide, which is, of course, the back, and which is called the *bend* is the part used for shoe purposes principally.

Finally the hide or skin is given another soaking to complete the swelling and put it in the best condition for absorbing the tanning material. In order to take out the least trace of caustic lime a weak acid bath is generally used. The pelt is now ready for tanning.

THE TANNING PROCESS

Up to this stage the hide or skin is still only raw animal matter. Decay has been temporarily stopped, but if the pelts were left in this condition they would soon begin to decay. If they were dried, to stop decay, the resulting product would be hard and stiff and of no value for shoe material. The process of tanning, in addition to stopping the decay, must make the hides or skins either hard and firm or soft and pliable, according to requirements, and of necessary strength for the use to which the leather is to be put.

In order to do this it is necessary to change the animal matter of the hides and skins by the use of either vegetable or mineral tanning compounds into the entirely different substance that is called leather. In other words, the tanning material acts upon the fibres of the skin

of the animal so that they undergo a complete chemical change and become leather.

BARK TANNING MATERIALS

As previously explained, almost every tree and plant contains chemicals that will, after a fashion, change hides and skins into leather. Many years ago the tanners of the United States had the advantage of an almost unfailing supply of the barks of various trees. Hemlock was obtainable in almost unlimited quantities in New York state, Pennsylvania, West Virginia, Michigan and Wisconsin, while oak bark was plentiful in the southern part of the United States. Hemlock and red oak are still reasonably plentiful on the Pacific Coast.

As the result of the distribution of hemlock there grew up a chain of tanneries in which hemlock bark was used, extending from Massachusetts, straight across the northern states to Wisconsin. Another group of tanneries was established, beginning in Pennsylvania and following the hemlock region down along the Appalachian Mountains into the southern states.

In late years tanners have been obliged to rely more and more upon imported tanning materials, although recently a considerable business has developed in the southern states where an industry has been established to make an extract of chestnut wood to take the place of the failing supply of oak bark.

Immense quantities of quebracho, sumac, gambier, mangrove, wattle and other tropical and semitropical products have augmented native tanning materials. The depletion of our bark supply and the introduction of extracts from various other trees and plants, both domestic and imported, have made somewhat misleading the use of the old terms of the leather industry, *oak, hemlock* and *union* (union being a combination of oak and hemlock), as applied to the tanning materials for leathers. The modern tanner operates by combining the various barks and extracts, because of the shortage of some of them, or in order to make special kinds of leather. Very little strictly bark-tanned leather is made today although the very high grade oak and hemlock sole leather is almost exclusively bark-tanned.

CHROME TANNING PROCESS

Within recent years a new process of tanning, called *chrome tanning,* has come into use, particularly for upper leathers. A German scientific man named Schultz invented or discovered the process. He came to America and secured a patent on his method. Two Philadelphia tanners became interested in Schultz and his method and a company was formed to control its use. After the expiration of the patent the Schultz method came into general and permanent use by tanners.

Sole leather is still largely tanned by the vegetable or bark process because the chrome process has not yet been satisfactorily developed for general use for sole leather. Upper leather, however, is now more and more tanned by the chrome process. The tanning material is a bichromate of soda or potash, hence the term *chrome* tanning. So-called chrome alum is one of the common bichromates of soda used. The chrome process is also called the *mineral process*, as distinguished from the *vegetable process*, in the case of hemlock and oak tanning. The chrome requires only a very short time for completion as compared with the hemlock and oak process.

For example, it may be stated that the average time required for tanning upper leather according to the bark process was about twenty days. The chrome process can generally be completed within twenty-four hours. To explain this feature of time saving it may be stated briefly that according to the bark process the skins are placed in the liquid bath and the chemical action allowed to develop naturally. According to the chrome method the tanning liquid and the skins are placed together in a revolving drum. The effect of this is to stimulate the chemical action and also to bring about a more complete tanning due to the forcing of the liquid into the cells of the skin.

In the chrome process of tanning, the skins

are submerged first in a weaker tanning liquor, for the reason that if they were subjected to a strong solution at once there would be a tendency for the pores of the skin to contract and resist the penetration of the liquor. By putting the skins into a weaker chrome bath first, they open up on the surface and permit the liquor to work through and through. The stronger solution then completes the work without resistance.

Following this first chrome bath the skins are treated with a second bath in a solution of hyposulphite of soda. There is then no further possibility of decay; the skin has been converted into the new substance — leather. One of the principal points of difference is that unlike the raw animal product, it cannot be dissolved in water. This feature of leather is of particular importance in connection with its use for shoe making purposes.

The chrome process makes possible the production of a flexible upper leather. In fact, the great advancement in women's shoemaking in the last ten or fifteen years, particularly in the way of the development of colored shoes and of light kid shoes, is due to the development of the chrome process. It was first successfully applied to goat skin in the manufacture of glazed kid. It is now used for nearly all calf skin and side upper leather and to a small extent, for sole leather.

RE-TANNED LEATHER

Within the past few years what is termed *chrome re-tanned* leather has been produced. Expert leather chemists have not been able to explain exactly the chemical action of re-tanning. But its practical action is simple enough. After the leather has been tanned by the chrome process, it is further treated with a bark tannage. In other words, after one system of tanning has been carried as far as it will go, another tanning agent or substance will take up the work and continue still further the tanning process. There are, however, no upper leathers tanned by this method.

SOLE LEATHER TANNING

Sole leather is probably the most common and best understood product of the tannery. As previously explained, there are several common terms which have to some extent lost their meaning in the development of the industry. However, the terms oak, union and hemlock still specify quite definitely the three kinds of sole leather tanning. While the employment of actual bark without any other tanning agent has largely gone out of practice and has been replaced by a combination of vegetable tanning materials, the resulting leather still has the same characteristics of the original three types of bark-tanned leather.

Oak leather is light and fair in color. Hemlock has the characteristic red color, while union is the shade between the extremes of oak and hemlock. In a general way oak sole leather is considered the highest quality, union coming next and then hemlock. So much depends, however, upon the quality of the hide and the *weighting materials* used, that a given tannage of hemlock may be intrinsically superior to a tannage of oak. These weighting materials, which will be discussed later, consist of bark or extraneous substances which are put into the leather to give it body or weight. This applies, however, only to leather sold by the pound.

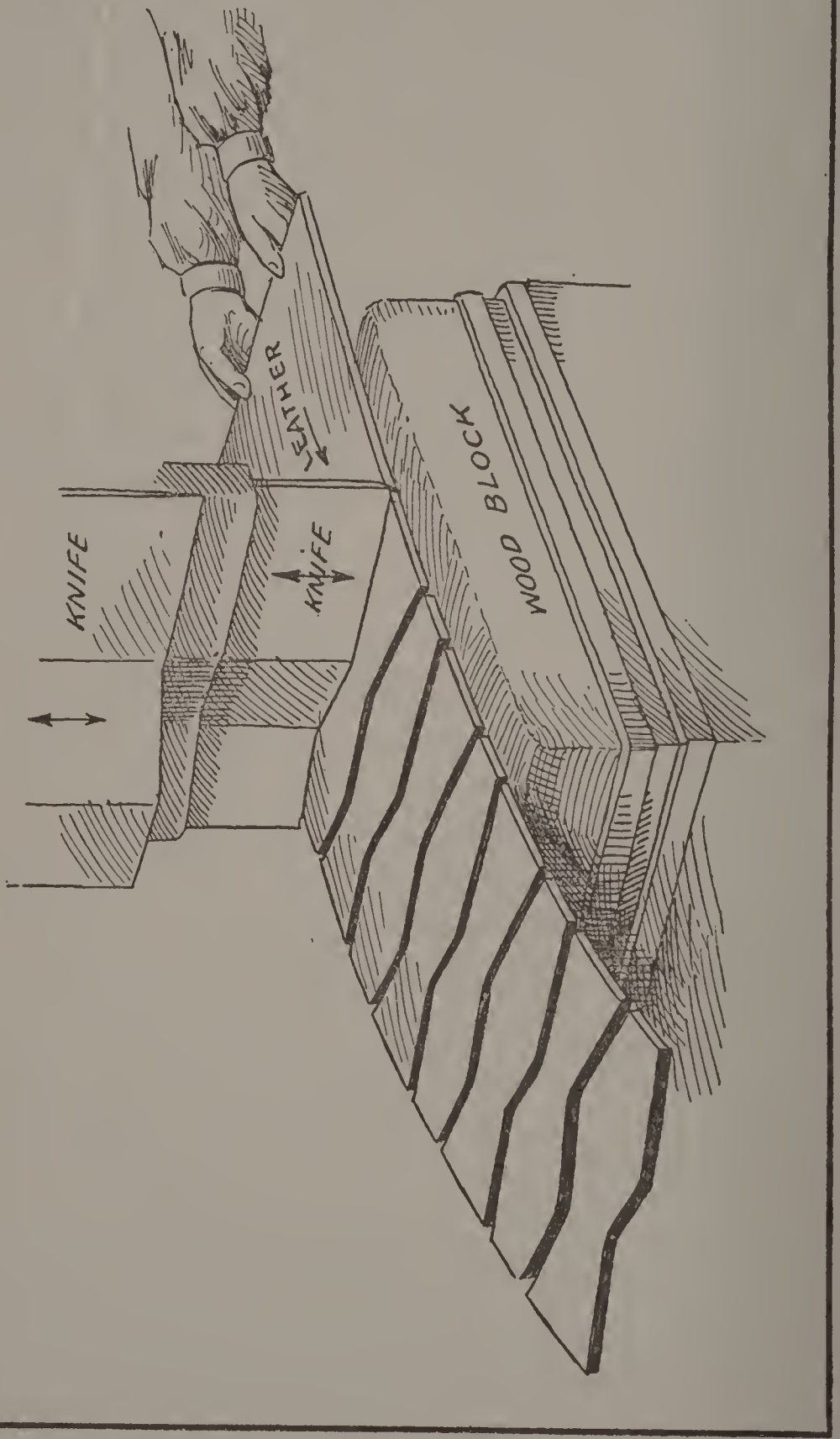
THE BARK-PROCESS DESCRIBED

In making sole leather the hides, after having been prepared, as previously described, are put into a vat of rather weak tanning material so that the beginning process of tanning may develop slowly. The hides remain there for periods depending upon the thickness of the hide and the kind of leather desired, and from time to time the strength of the tanning material is increased. Then they are put into vats, known in the trade as *lay-aways*. The bottom of the vat is covered with a layer of ground bark, and then a layer of hides is put in. Next is put on another layer of ground bark and again a layer of hides, and so on. The vat is then

filled up with tanning material, made by dissolving ground bark. This process is repeated six or eight times over a period of several months until the hides are thoroughly tanned. Within late years various machine processes have been developed. However, in all of them the method is similar. The machine holds the hides on shelves and the tanning material flows through the machine in such a way that the hide receives first the weaker tanning material and gradually the stronger until it is fully tanned. Of course, the advantages are those of time and labor saving.

After the hides come out of the tanning material it is necessary to remove what is known as the *bloom* which is a yellowish coating on the surface of the hides. This is done by *striking*. The striking process is now commonly done by machinery. The machine consists of a disk carrying a series of blunt knives and has an adjustable foot lever to regulate the amount of pressure. The knives come down with a quick blow and at the same time scrape along the surface in a way to remove the bloom, lay the grain of the leather, improve the surface and bring out the natural color.

Next some form of mineral oil or cod liver oil is rubbed into the skins on the grain side and then the skins are dried in sheds. Air is forced among the hides by fans and carried off by ventilators.



CUTTING THE SOLE

OAK SOLE LEATHER

As already explained, oak sole leather is normally the highest grade of tannage and is distinguished principally by its fine grain, close compact texture and its light tan or straw color. Because of its tough character and its close fibrous texture it resists water and will wear down before cracking. It is by many considered better than any other leather for flexible soles requiring waterproof qualities.

An illustration is given to show the method of cutting the sole. The leather after having first been cut into strips to the width desired is run through the machine. Two knives operate alternately up and down to cut out the sole, as shown in the sketch.

HEMLOCK LEATHER

Hemlock sole leather normally is dark red in color. It is hard and inflexible. The color and character of the leather are caused by the strong tanning properties of the hemlock bark. This is sometimes modified by the use of bleaching materials, after the leather has been tanned, or by diluting the tanning materials. The result is that of giving the leather the appearance of a spongy texture.

Hemlock leather is used extensively for men's and boys' stiff-soled, heavy shoes where little flexibility is required or expected. Because of

its long wearing qualities it is the best leather for certain of the cheaper grades of nailed or pegged shoes. Hemlock when used in shoes, where a flexible sole is required, does not give good results because it cannot resist the continued bending to which it is subjected. After the sole is worn half through the continued bending causes the sole to crack crosswise. Then, at the crack, the pores of the skin are opened up and the ground moisture readily penetrates through the sole. However, the best tannages of hemlock sole leather would be better even for flexible soles than the poorest tannages of so-called oak or union sole.

UNION LEATHER

The texture and appearance of union leather is dependent upon the proportion of oak and hemlock bark used. In recent years oak has become so expensive that union leather is now commonly tanned by a combination of hemlock and other tanning agents. The red color and the hard texture are modified by bleaching the leather to the desired color and texture. This produces leather that lacks the fine, close tannage of genuine oak leather and at the same time prevents the hard tannage of hemlock leather. Union leather produced in this manner is a sort of mongrel, being neither oak nor hemlock and not possessing the best qualities

of either. However, on account of the economy in *cutting* qualities (a larger percentage of the hide can be cut into soles than in the case of oak leather) it is largely used in the manufacture of soles for cheap shoes where a greater degree of flexibility is required than can be obtained from straight hemlock tanning. This is particularly true in the case of moderate-priced women's shoes.

CHROME SOLE LEATHER

Chrome re-tanned sole leather is coming into more general use every year. Waterproof, chrome-tanned sole leather is more expensive than any other sole leather and is said to outwear bark-tanned sole leather two and three times. It may be distinguished by its blue green color, in which condition it is generally left in the finished shoe. The leather is flexible enough to be used in all kinds of shoemaking.

Untreated chrome sole leather is almost entirely made into athletic shoes when provision against moisture does not need to be considered. The leather is very slippery when wet and for that reason it is well adapted only for shoes to be worn in dry climates. It has very good wearing qualities. Its color is a greenish white.

In chrome-tanned sole leather the fibres of the skin are contracted and it is impossible to *plump* or *weight* the leather. In a bark tanned leather the fibres are swollen and the hide may

be made almost any weight, according to the amount of tanning material forced into the skin. This increase in weight of bark-tanned leather is called *gains* of tanning, and amounts to the weighting of the leather with tanning materials and with oils and greases. As sole leathers are sold by weight, the chrome leather cannot be sold in competition with the vegetable-tanned leathers because of this gain in weight in the tanning of the leather.

TANNAGE OF UPPER LEATHERS

The tannage of upper leathers by the bark or vegetable process is practically identical with that of the tanning of sole leather, excepting that weaker tanning materials are used. Of late, the chrome process, already explained, has been developed to such an extent that it is now used for practically all black-finished upper leathers. Quite recently it has been developed also for colored upper leathers. It seems certain that within a few years the tannage of upper leathers by any other means will be very uncommon.

The preparation of upper leather for tanning is carried out in the same way as that for sole leather. The skins are put into a chrome bath which is made by dissolving bichromate of potash or soda in boiling water, slightly acidified. The chemicals work into the very heart of the

leather and form a permanent, indivisible part of the whole. The tanning material cannot be washed out or separated, as can frequently be done when upper leathers are tanned by a vegetable process. The result is an extremely soft, light leather, particularly suitable for the uppers of shoes. It is non-absorbent and durable. It is not affected by water — even hot water; while vegetable tanned leather is inclined to get hard and shrink under similar circumstances. Furthermore, it is not easily stained and can readily be made washable.

Upper leathers are sometimes tanned by other chemical means. One of these processes is called *tawing*. The skins are soaked in a solution of lime and salt. As this would leave them stiff and hard they are later filled with a paste of egg yolks and flour or sometimes an oil, such as olive oil. This is worked in by a machine; after which the skins are finished in the same way as other upper-leather skins. Only a small amount of leather is made by the tawing process. This, generally, is used for the uppers of women's shoes.

The Indians tanned skins into leather by the simple process of smoking them. Smoke, as we know, has the effect to contract or draw together, and this, after a fashion, served the purpose of the Indian in tanning skins. The Eskimo is known to have made leather by the primitive process of chewing it.

DRESSING OF UPPER LEATHER

Small skins, such as calf skins, are dressed whole, that is without splitting, but the larger pelts, such as cowhides, sheep and horsehide, are split. Leather to be used for soles, however, is not split because the full thickness of the hide is required in manufacturing.

For shoe purposes only the outer or grain split of the leather is used, except in the case of very cheap shoes where an imitation grain finish may be put on an inner split in order to make it usable. The inner or flesh splits are sometimes used also for innersoles in the lower-priced shoes. All leathers are required to be *shaved* so as to give them an even thickness over the entire surface.

The skins are next scoured in warm, soapy leather. All upper leather, whether vegetable or chrome tanned, must be *fat liquored*. That is to say, a certain amount of fatty material must be applied to the skin in order that it may be made mellow, workable and serviceable.

Fat liquoring is an important step in the process of tannage. The difference in the final product of different tanneries is often due to the difference in fat liquors used and the way in which they have been applied. In addition to oils, such as cod liver oil, fish oil, neat's foot oil, and wool fat oils which are used in fat-liquoring the light upper leathers, tallow and waxes are

combined to make the leather partly waterproof and to assist in producing desired effects in the finish.

It is well to point out in this connection, that leather is fat-liquored to protect the fibres of the material from frictional wear. These fibres must be oiled or lubricated on the same principle that parts of a machine that are subjected to friction must be oiled. The dry fibres of the leather, rubbing together, would soon break and the result would be that the leather would give poor wearing service in the shoe.

SNUFFING

Before adding the dressing, in the case of upper leather, it is sometimes necessary to shave off the grain and to fill in the surface so as to cover up defects, such as fat wrinkles and scratches. This process is called *snuffing*. The same method is employed to produce a very smooth surface desirable as a style of finish in certain uses of the leather.

DYEING

In general the process of dyeing leather is much the same as that used in dyeing fabrics. The most common method at the present time is known as *drum dyeing*. The skins are put into a tank which contains the dyeing liquid. This tank or drum, as it is known, is then revolved or rotated for a sufficient time to enable

the skins to completely and evenly take up the coloring material. They are then removed from the drum, rinsed clean and hung up to dry.

A later method is that known as *flat-surface dyeing* and is quite commonly used in the case of cordovan and some other colored leathers. By this method the skin is stretched out on a table and the dye is put on with a brush. Of course, in either method of dyeing it is necessary to prepare the skin by applying first a *mordant* which unites with the chemicals of the dye to fix the color. After the flat-surface dyeing, the excess coloring matter is washed off and the skin is dried in the same manner as in the case of the drum dye.

COMBINING THE DRUM DYE AND THE FLAT-SURFACE PROCESSES

With tan colored leathers it has now become quite customary to combine the two methods. The drum or bath dye forms the real foundation color, and the flat-surface dyeing is afterwards employed to improve the general appearance. In the case of chrome-tanned leathers, because of the compactness of the fibres, the skins are frequently dyed before fat-liquoring. This is necessary for the reason that if the skins were allowed to dry after fat-liquoring and before dyeing the fibres would contract and it would then be almost impossible to permeate the leather sufficiently with the dye to produce a good result.

For this reason it has recently become a general custom to dye chrome leather twice, first by the bath dyeing process, then by the flat-surface or brush dyeing. The result is to give a better evenness of dye and a greater freedom from the appearance of defects and fat wrinkles. The tannage in colors of chrome leather is an industry that has been developed very rapidly within the past few years. Until the development of the method of re-dying by the flat-surface method, it seemed impossible to get the same smoothness that resulted in the case of vegetable tanned leather. This was so because of the fact that the vegetable process fills up the imperfections whereas the ordinary chrome process does not.

The chrome black leather was first developed and it proved so much better than vegetable-tanned black upper leather that tanners kept working to develop also a satisfactory method of dyeing chrome upper leather in colors. This process of re-dyeing by the flat-surface method seems to have overcome all of the difficulties.

This so-called "painted leather" as a matter of fact is fully dyed through and through in a dye bath first and then an additional surface dye is put on. Of course, an occasional unscrupulous tanner might be content with simply a flat-surface dye and as a result his leather, when the edge was scrubbed off, would show up the inner part of the skin as undyed.

Some tanners have tried to overcome dyeing

difficulties and to produce a fine smooth-finished chrome colored leather by tanning first in chrome and then retanning in some vegetable material. This process is used quite commonly in the case of heavy leathers and has been specified for army shoes. It seems better, however, in the case of upper leathers for fine shoes to retain the customary chrome tannage and then to add a flat-surface dye after the first bath dye.

KINDS OF DYES

While natural dyes such as cochineal, indigo and the like, have been used in the past to dye leather for fancy shoes, they have been replaced in recent years by the coal tar dyes. In using these aniline dyes it is possible to omit the mordant which is otherwise required in order that the skins may take the color evenly. The reason a mordant is not necessary is that the tannic acid used in the tanning process acts as a mordant itself. The development of aniline dyes has made possible a wide variety of colors in shoe leather. The cost of these dyes is less; another advantage is the matter of time saving in their use, as well as their greater brilliancy of color.

CHAPTER III

TYPES OF FINISHED UPPER LEATHER

SIDE UPPER LEATHER

Side upper leather is made from cow hides. If very light hides of first quality are used it is difficult to distinguish the leather from calf skin after it has been made into shoes. At the present time, the leather is most commonly tanned by the chrome method. It has good wearing qualities and is reasonably fine in appearance.

There is an old prejudice against "cowhide" leather. While this was perhaps justified years ago it is not warranted in the case of modern tannages and finishes. As a matter of fact, shoes of very high grade side upper leather will give better service than those of the very low grade calf skin. The chrome process has revolutionized the making of upper leather and has made possible the development of a satisfactory leather from cow hides. Modern methods of finishing have added to the improvement of the product so that today all of the well known finishes of calf skin are duplicated in side uppers of cowhide stock. Seal grain, buff oil grain and

satin calf are various finishes of side upper leather in imitation of various types of calf skin.

CALF SKIN

The qualities of calf skin have already been described in Chapter I in discussing the different types of hides preparatory to tanning. As was there stated, calf skins have always been preferred as a material for making shoe uppers, especially for men's shoes. In substance, fineness of grain and texture there is nothing quite in the same class as high grade calf skin. This stock has been a favorite for so many years that it is perhaps the most generally understood leather. In the majority of instances, a shoe salesman does not have to explain further when he tells a customer that a shoe is of calf skin.

The fact should be remembered, however, that calfskin is by no means the only desirable leather for shoe making purposes. It serves its best use when a fairly substantial shoe is required. A kid skin, for instance, is lighter and more porous and has its special advantages in those cases where coolness and light weight is desired.

BOARDED CALF

The finish of calf skin known in the trade as *boarded calf* is that of a tanned skin having a pebbled or checkered pattern of fine creases. The effect is produced by a process called *boarding,* and is obtained by rubbing the skin

with a board in order to raise the grain and to bring out more prominently its natural beauty. The term *Box calf* is generally used to designate this finish. Strictly speaking, however, it is a private name originally used to designate a manufacturer's special brand. But it is now commonly used in the trade to represent any leather that is boarded so as to have a grained effect. Cow hide is frequently made in imitation of boarded calf skin by passing it, under pressure, through rollers having the desired pattern; in that way reproducing it upon the leather. Box calf is almost entirely waterproof and is made in either black or tan color. It has come into general use both here and abroad.

Willow calf is the same as box calf, except that the name is applied to colored stock. This name was originally privately owned but has now come into general trade usage.

SMOOTH-FINISHED CALF

The names *Velour* and *Gun Metal* are also among those that are privately owned by calf skin manufacturers. These too are terms now generally used, perhaps in injustice to the owners, to designate a smooth-finished black calf skin.

Mat calf is a dull-finished calf skin, used most commonly for the tops of shoes. It has a soft, dull, black finish, resulting from a treatment of bee's wax and olive oil.

When mat leather is used in the uppers of patent leather shoes, it is necessary that particular care be taken if oil is to be used in cleaning or dressing the shoe. Although the oil could be used to advantage on the mat calf it would have the effect to ruin the finish of the patent leather. The salesman would do well to bring this fact to the attention of the customer.

Russia calf, so called, was originally not calfskin at all, but split leather. The process originated in Russia and as first produced the leather was a deep red color, possessing a characteristic odor. This leather was not of sufficient tensile strength for shoes and was used for purses and other articles not requiring the strength demanded in shoe leather. The tannage was, however, of so desirable a nature, owing to its smoothness, flexibility and excellent appearance that our tanners perfected it for calfskin, and hence made it possible for shoes. This process, improved to date, makes what is known as Russia calf.

Originally this leather was treated with birch oil to give it the characteristic odor of the Russia calf, to help soften the leather and to furnish a protection against insects.

Wax calf is finished on the flesh side with a wax-like surface. This was one of the earliest methods of finishing calf skin. At the present time, however, there is very little of it being manufactured.

RUSSIA CALF (Smooth)
Natural Size

RUSSIA CALF (Smooth)
Enlarged

GUN METAL (Smooth) CALF
Natural Size

GUN METAL (Smooth) CALF
Enlarged

Burnished calf skin is similar but generally of a finer quality.

SUEDE FINISH CALF

This leather is finished on the flesh side to imitate velvet cloth. The word *suede* is equivalent in the French language to the word Swedish; the finish having first been developed in Sweden. The term *ooze* leather is also used to designate the suede finish. This also was originally the copyrighted name for one manufacturer's brand of suede leather. *Velvetta,* a calf leather, is still another trade name which suggests the soft appearance and feeling of velvet characteristic of suede leathers. All classes of suede are finished on the flesh side of the leather and are treated to produce a nap surface to represent that of velvet. Most commonly suede is made in white, cream and other light colors. In spite of the delicate appearance the leather has it possesses very excellent wearing qualities.

GLAZED CALF

The finish of the glazed calf is more of a glossy effect rather than the very shiny or glistening finish of patent leather that is suggested by the term *glazed.* The finish is produced first by the application of a thick coating of seasoning mixed with black or other coloring matter, and then by having this rubbed into the skin under pressure. The polishing surface is a

glass agate which is worked back and forth upon the leather until the coloring matter is forced in and the glazed or glossy finish is produced by friction.

PATENT LEATHER

In the trade much discussion develops upon patent leather. There have been times when manufacturers and shoe retailers have had printed cards put into the cartons and have posted notices in the stores declaring that patent leather shoes were not to be warranted. It is true that the method of making patent leather is not one absolutely to guarantee long wearing qualities. But this is true also in differing degrees in the case of various dressed and colored leathers. However, patent leather prospers for the very good reason that it is the most beautiful finish for shoes for dress and evening wear.

The early patent leather troubles were almost invariably due to the wearing of the shoes under wrong conditions. Shoe manufacturers and tanners who have made investigations along this line have found cases of servant girls scrubbing the front steps and hired men mowing lawns while wearing cheap patent leather shoes. It should be remembered also that much of the criticism of patent leather dates back to the early days when the present improved system of making this leather was not known. The processes have been so largely perfected that

the old arguments against it no longer hold. At the same time the shoe trade and the consuming public have become more thoroughly educated concerning patent leather and do not now subject it to the rough wear for which it is not intended.

Patent leather, as it appears in shoes, is usually of three kinds, patent colt, patent kid and patent side leather, which is a cow hide. There was at one time also a small amount of so-called French patent calf used in the United States. This actually was a product of Germany. It was a vegetable tanned leather with a heavy glazed finish. The objection to a finish of this kind is that there it not sufficient flexibility to it and as a result it is likely to crack readily. Patent colt and kid are used for the most part in the best and medium grades of shoes, and patent side leather in the medium and cheaper grades.

Patent side upper leathers or splits have more thickness than the ordinary run of colt or kid. As far as wearing qualities go, patent leather made from splits would not, on the average, be expected to resist breaking-through as long as patent colt or kid. Side leather, being a split of cowhide, has the fibres of the skin cut through or across laterally, thus, in a measure, untying what we might call the " knots " formed by the natural interlacing of the fibres. The whole skin of colt or kid, not split, and used as nature

made it, is by the same token intrinsically strong; the fibres have not been "untied." As far as finish is concerned, if equally well done, there should be no more checking in patent side leather than in colt or calf. Whatever may be said in comparing side leather and colt or kid applies to the same leathers when japanned.

THE PATENT LEATHER PROCESS

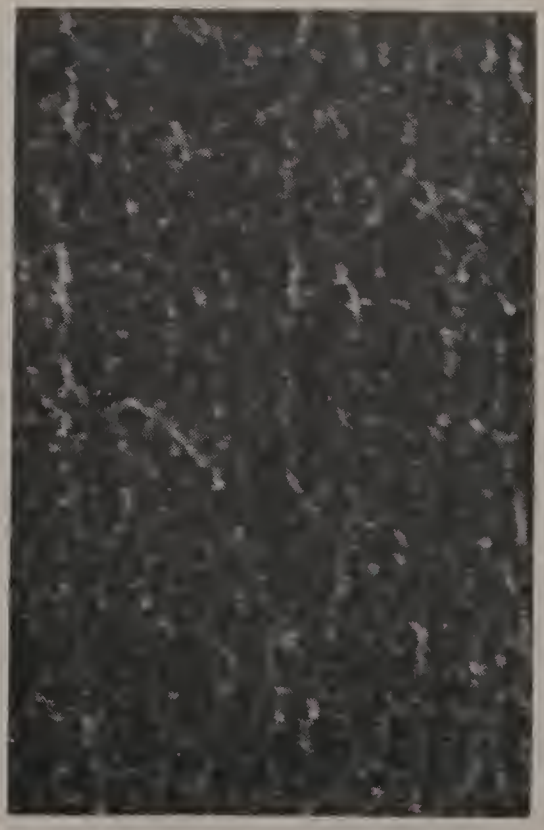
Chrome tanned skins are used entirely in the manufacture of patent leather. Skins to be used in making patent leather are given a slightly different process of chrome tannage than that used to tan skins for other finishes. It is a variation in the process used mainly to produce more firmness in the leather. After the skins have been tanned they are then freed of all greasy matter in order to put them in condition to receive the finish and to prevent the latter from peeling after it has been applied. In some cases one daub coat and two varnish coats are put on, in others two daub coats and one varnish coat and in still other cases one daub coat and one varnish coat are applied, depending on the character of the skin.

The basis of these coatings is essentially boiled linseed oil. The varnish contains in addition the required coloring matter. One of the chief functions of the linseed oil coating is to give flexibility in the finish. It is evident, of course, that without this flexibility the patent

SOLE LEATHER (Cowhide)
Natural Size

SOLE LEATHER (Cowhide)
Enlarged

BOARDED CALF
Natural Size



BOARDED CALF
Enlarged

leather would crack and thus be worthless for shoe making. Another important part of the process is to get a finish that will not dry out. Various methods and the use of a variety of different substances have been introduced as a means to arrest drying of the patent coating after it has been applied to the leather.

After the application of the varnish coat, the skin is put into an oven which is heated to a temperature of from 120 to 140 degrees Fahrenheit and is dried for about 24 hours. It is then put in the sun and allowed to remain from six to ten hours, depending on weather conditions. This is done to dry the skin thoroughly and to remove the *tacky* or sticky feeling. The skin is then removed from the frame and after trimming and measuring is ready to be assorted for weight and quality.

It is practically impossible for a person to tell from outward appearance the difference in quality of shiny leathers. However, on general principles, the leather with the lighter finish, on which the grain shows through the enamel, will prove more serviceable than that on which the finish is so thick as to hide the grain. The use of reputable makes is therefore the dealers' chief safeguard against inferior quality.

CARE OF PATENT LEATHER

When a shipment of patent leather shoes comes to hand, after being in transit during cold

weather, the utmost care in handling should be exercised for the reason that the cold weather has a tendency practically to freeze the finish. The warmer temperature of the store will, however, bring the leather to its normal condition without any bad effects. There should then be no further danger of cold-cracking in handling.

In order to restore the bright appearance to a patent leather shoe it is not necessary to apply a great deal of dressing paste. This is especially true when the shoe is new. The use of a damp cloth to take off the surface dust is all that is required. The coating of shoe paste is not as bright as the patent leather itself and when applied to the shoe will naturally detract from its appearance.

Care should be taken when shining the shoe with a strip of cloth, not to rub the leather so briskly that the friction will cause the leather to burn.

A sudden change in the temperature and weather conditions to which patent leather is exposed has often been the cause of damaging it. As with other materials of fine texture, patent leather requires reasonable care. For example, the best results could hardly be expected with a dancing pump that had been used in the very warm atmosphere of indoors all evening and immediately after had been exposed to the cold and snow of outdoors.

PATENT LEATHER

Original photograph retouched to show the shiny effect produced in japanning the grain side of the leather.

SUEDE FINISH CALF

To show the dull finish resembling that of cloth. The skin is finished on the flesh side and as a result the grain of the skin does not appear on the finished side of the leather.

Sometimes patent leather in cold weather will show signs of *checking* during the first few days' wear. (Checking means the creasing of the leather in small squares.) It often leads the customer to return the shoe because of the fear that the leather will continue to check and eventually ruin the shoe. It should be impressed on the mind of the customer that after the noticeable checking of the first few days, the leather will thereafter check so gradually as to be hardly noticeable, provided, of course, it is a good piece of patent leather. After the wrinkles in the leather have become set to conform to the walking movement, there should be no further creasing of the shoe.

POPULAR USAGE

The modern patent leather is a great deal softer and more comfortable on the foot than the old patent leather, on account of the soft chrome tannage. It will conform with almost any costume and has grown to be suitable for almost any occasion. The lines of the *last* or design of the shoe are brought out to excellent advantage in the patent leather shoe. Another claim frequently advanced for it is economy from the standpoint of shining. An important point to bear in mind at all times is that patent leather shoes should be fitted carefully and snugly to give the wearer the best results.

CUTTING THE SKIN

Following is an illustration to show the lay-out of a skin to produce the maximum results in cutting. The principal points to be considered are those of reducing the amount of wastage

LAY-OUT OF A SKIN FOR CUTTING

and of placing the pattern so that the best parts of the skin may be used for the most important parts of the shoe. Some skins lend themselves much more readily to one pattern than another and a knowledge of this is a fine point in a good

buyer's qualifications. If he is a cutter and familiar with the patterns to be used, he is much better equipped to get full value for his money than a man without this knowledge.

CHAPTER IV

TYPES OF FINISHED UPPER LEATHER (*Cont'd*)

KID LEATHER

From what has previously been said in discussing goat skins, the reader will have gathered something of the size and importance of the kid leather industry. Especially in recent years the development of business in glazed kid has been tremendous. Strictly speaking, the term "kid" is a misnomer because the skins of the baby kid, which are the only true kid skins, are used for making cheap gloves. The glazed kid of commerce is made from the pelt of the adult, short haired goat. There is no other shoe material that combines the peculiar qualities of glazed kid. The skin is mature and complete in upper structure and yet is fine in texture. Goat skins, because of the peculiarity of their fibres, cannot be split by any splitting machine. However, the sheep skin, calf skin and the pelts of similar animals can easily be split. When a goat skin is too heavy, instead of splitting, it is first shaved on the flesh side and then ground by means of abrasive wheels to produce an even surface. In a shoe the kid skin is especially easy and com-

fortable on the foot. It lends itself admirably to coloring and is responsible to a large extent for the great variety of fashionable shoe styles and colors recently brought out.

VARIETIES OF KID LEATHER

There are sixty-eight recognized kinds of goat skins and each possesses its own peculiarities of texture, thickness and grain. The skins are made into either glazed or mat kid; often tanned by the same chrome process. *Glazed kid* derives its name from the French word "glacé," meaning glassy. Its finish is obtained by striking or burnishing the skins on the grain side. It is made in black and colors, particularly browns and greys, and is known by as many names as there are manufacturers of it. A name by which it is commonly known is *vici kid*. However, this is simply the trade name of a manufacturer who was one of the first to produce and introduce the glazed finish of kid leather.

Glazed kid is used in the uppers of shoes and makes a fine, soft shoe that is particularly comfortable in warm weather. It is claimed for it also that it prevents cold feet in winter, because of the unrestricted blood circulation of the foot that is made possible in a shoe of soft leather.

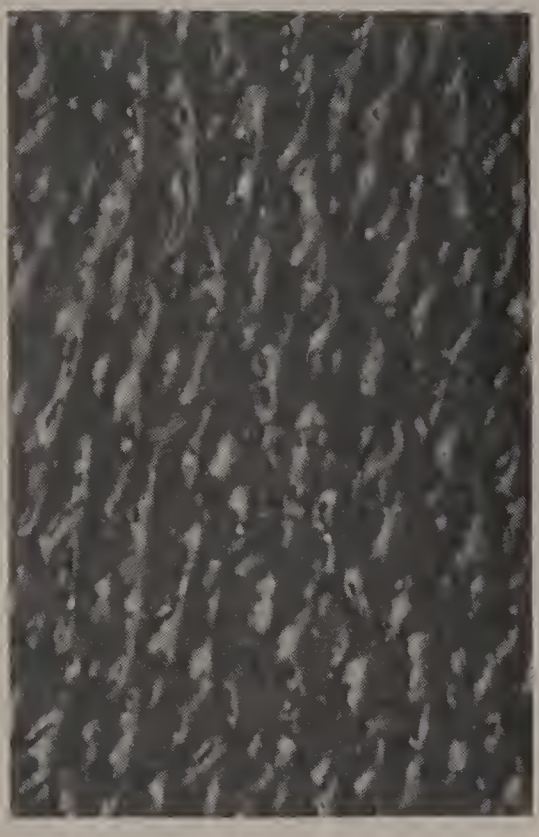
Mat kid is a soft, dull black kid — the softness being the result of treatment with bee's wax and

olive oil; a process similar to that used to produce the same finish on calf and other skins. The finish is applied to the grain side, the same as with glazed kid. The use of mat kid is principally for shoe tops. It is very similar in appearance to mat calf and is often used in preference to it as it is much lighter in weight and about as strong.

Suede kid is really not tanned but is subjected to a *fat process* with an egg solution to make it soft and pliable. This method of finishing leather is called *tawing*. The skin is stretched and the color is applied by the flat-surface or brush method without having been previously bath-dyed. Consequently the color does not permeate the skin but is merely on the surface. Suede leathers are made from cabrettas and split sheep skins, in spite of the fact that they are called suede "kid."

The so called *Castor kid* is Persian lamb skin, finished the same as suede, and is used in making very soft, fine appearing leather for shoe tops. The leather is of such light weight that it is necessary to reinforce it with a backing of cloth before making it into shoes. This is done by glueing or otherwise adhering to the leather a cheap cotton fabric. In many of the names used in the trade it will be noticed that although the leather may be known as "kid" it does not necessarily represent a skin taken from the baby goat. The same is true also of other leathers.

MAT KID
Natural Size



MAT KID
Enlarged

GLAZED KID
Natural Size

GLAZED KID
Enlarged

SHEEP SKINS

The most serviceable purpose of sheep skins in the shoe industry is in the making of top facings, stays for buttons and lacings and other like uses.

Buck skin, which was originally deer skin tanned in oil, is now made from any soft leather, especially sheep skin and light weight cow hides. It is finished in white, gray and yellow shades.

Previously it has been pointed out that the genuine cabretta is a cross between a goat and a sheep. However, many of the cheap leathers, now called cabretta, are nothing more than sheep skin. The leather is too loose and stretchy for serviceable wear on the outer part of a shoe.

COLT SKIN — HORSE HIDE — CORDOVAN

The fronts or forward portions of the colt skin are largely used for shoemaking purposes; principally in the form of patent leather. From the horse there are certain muscular portions, taken from the butt of the animal, that have a very firm texture, which possess excellent wearing qualities and also allow for a desirable high polish. These are mainly used in making men's shoes, under the name of *cordovan* or horse hide.

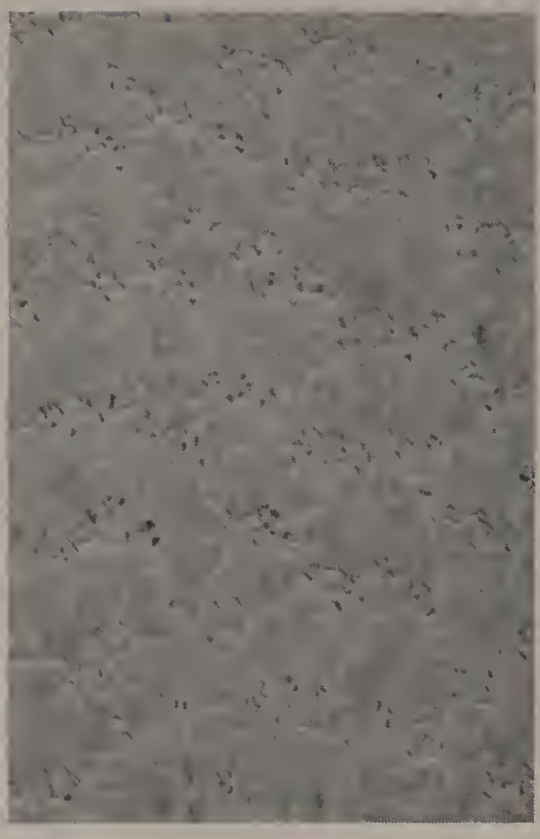
Horse leather originally was considered the only kind fit for shoemaking and most of the specimens of boots made in the middle ages and somewhat later are of this sort of leather. Cor-

dovan, a term which is now in common use for horse hide tanned into leather, takes its name from Cordova, Spain, which was a very famous tanning centre in the earliest days. The reason Cordova was a tanning centre was because of its immediate proximity to alum mines. Alum has always been and is today an important factor in tanning. Genuine cordovan, or *shell cordovan,* as it is more correctly called, is not made from the hide of the horse at all, but from a fibrous shell or flat muscle in the butt, underneath the hide proper.

Children's shoes are frequently made from what is called in the trade *bear skin.* This is commonly a smoked horse hide and is particularly desirable because it is washable and has long wearing qualities. However, the texture of the leather is very dense, and a high shoe made from horse hide is likely to draw the foot. For that reason the leather is much better for sandals where air circulation may be had other than through the leather itself.

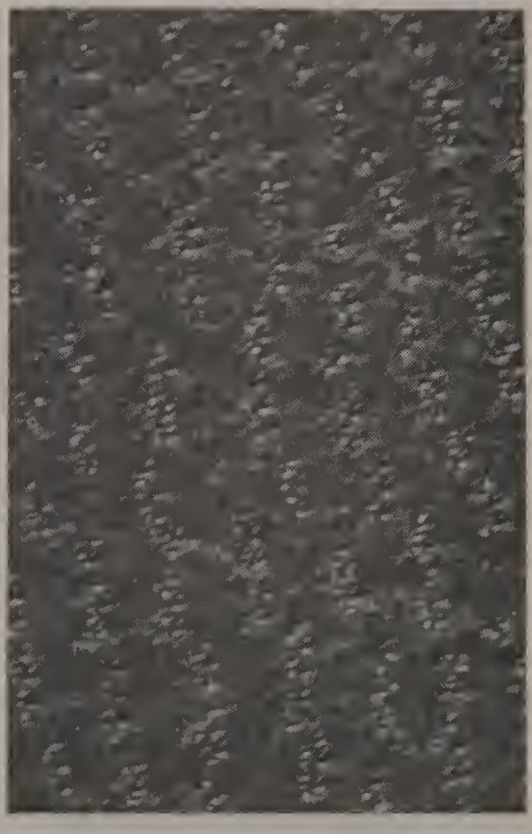
In recent seasons the word "cordovan" has come to have a meaning in the trade different from what it was originally. Of late it has been used to designate red or mahogany shades of calf skin leather. The advantage of cordovan is that it makes up into men's shoes a fine looking and long wearing product and in addition is practically water-proof. Whereas it is an excellent material for cold climates, it has, for general

SHEEPSKIN
Natural Size



SHEEPSKIN
Enlarged

HORSEHIDE
Natural Size



HORSEHIDE
Enlarged

purposes, long since lost favor in the race with calfskin, in the United States because of the ill effect it has upon the feet.

CHAMOIS AND KANGAROO

Chamois is an oil-tanned leather made originally from the skin of a small animal known as a chamois. The leather is very pliable and is also washable. Like all other desirable leathers it is, of course, much imitated at the present time by oil-tanned leathers of various other animals.

Kangaroo kid is the name given to a kid finished in imitation of the skin of a kangaroo. A few years ago a considerable quantity of kangaroo leather was brought to this country, but the animal is now almost extinct. The kangaroo kid has therefore been introduced to meet the demand for the original skin because the supply of the genuine product is so small that it is no longer a factor in the leather business.

FANCY LEATHER

A wide range of use is made of *fancy leather* in both men's and women's slippers, in toppings, insertions, facings and linings of shoes. The leather is made from sheep and goat skins; particularly from India sheep and goats. It is produced in a variety of colors and finishes.

All kinds of smooth, bright colors are used to decorate men's and women's slippers, and combinations of all shades are found. Seals and glazed kid, in reds and browns, are used for

men's house boots and the whole gamut of color may be found in ladies' boudoir slippers.

Fancy leather is used extensively in combination with patent leather in certain classes of shoes. There is a variety of finishes to choose from; seal, walrus, colored patent, gold, silver and champagne kid and dull kid in either smooth, box or pebbled finish.

These leathers are also used as a means of decoration in insertions, panels, outside stays and the like, usually in strips, scrolls and other designs. Patent leather or ooze outside stays or scrolls of the same, are sometimes found on the vamp or forward portion of the shoe. Again, an inlay of gold or white kid may be used in combination with vamps of almost any color.

Facings are selected from fancy leather to make the inside of the shoe attractive and to increase its wearing quality. Leather of dull or glazed finish is used, in typical *shoe colors* such as tans, creams and browns, for facings and side and back stays.

About the same kinds of leather in tan, cream and gray shades are used for shoe linings. In addition may be found ooze leather that prevents the shoe from slipping at the heel, and waterproof leather to prevent decay.

CARE OF LEATHER

Even the best quality of leather will be destroyed through lack of proper care. It is im-

portant to know, perhaps above all other things in this connection the extreme danger of applying heat to wet leather. Few people realize how sensitive leather is to heat. This applies more particularly to sole and vegetable tanned upper leather. Wet leather will not stand without damage more heat than 120 degrees Fahrenheit, or about the heat the hand will bear. Dry leather will stand a much higher temperature. The retail shoe salesman should caution customers that wet shoes rapidly dried before the fire or on a steam radiator are almost sure to be injured. Furthermore, good leather will be damaged just as readily as poor leather. The fumes from burnt gas are especially destructive to leather. Wet shoes placed above a gas stove are in double peril; first from the heat and second from the air that has been deprived of its oxygen and is charged with products of combustion.

The prejudice against distinctive "work-shoes" frequently results in the use of fancy and fragile footwear unsuited for the purpose of the wearer. This is a very important consideration that should be explained to the prospective customer whenever the opportunity occurs.

STUDY OF LEATHER

It must be acknowledged that it is almost impossible for even an expert to determine the exact quality of the leather after it has been

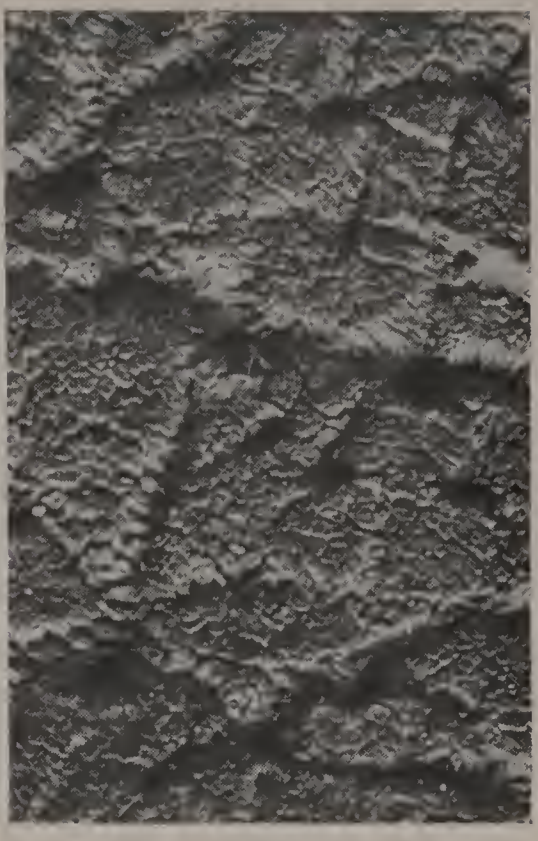
made into shoes. The manufacturer's leather buyer, however, is required to know leather. He is in a position to examine carefully the stock in piece form, and upon his decision depends the quality of leather supplied to the factory. On the other hand, it must be remembered that the standards of value in this business, as in all others, are quite definitely fixed and it is therefore largely a matter of the price the buyer is willing to pay that determines the quality he will receive.

The shoe salesman should spend as much time as possible actually handling the shoes in his stock and studying the different types of leather so as to get a ready acquaintance with the main qualities of each.

In general the quality of the leather depends upon the fineness, strength and flexibility of the skin and upon the carefulness and success of the tannage and finishing. In the finished shoe good leather may be recognized by the softness, flexibility, evenness and clearness of color as evidence that the tanning has been entirely completed. Blotches in color result from spongy and loose texture and show unevenness in tanning. In a similar way, dry and hard parts are the result of irregular tanning.

The strength and durability of the leather depend upon its texture and flexibility. All upper leather, when properly tanned, has a reasonable amount of strength. This will vary

PIGSKIN
Natural Size



PIGSKIN
Enlarged

KANGAROO
Natural Size

KANGAROO
Enlarged

according to the use to which it is to be put. Sole leather, of course, should be firm and compact and free from stretch.

The softness of the leather is a very much needed characteristic in the case of upper stock. This is brought out by the dressing and fat-liquoring. A good upper leather is soft and flexible and yet sufficiently firm to hold its shape and to wear well. A good upper leather is partially waterproof. However, a sole leather should be practically waterproof, provided it has been properly tanned. Leather that takes up moisture readily deteriorates rapidly and consequently does not give satisfactory service. Modern, well-finished upper leather is so nearly waterproof that if a drop of ink were dropped on the surface it would not soak in and might be readily wiped off without leaving any mark.

In a well-finished leather the grain should be brought out and at the same time defects and fat-wrinkles should be obliterated by finishing or by snuffing.

The color of good leather should be fast and sun proof. During the European war, when supplies of dyes from Germany were first cut off, some difficulty was had to get other dyes to replace them. However, the experience we had in developing our own product was finally so successful that we are now practically independent of foreign supplies.

The only way that the kind of leather, except

sheepskin, can be definitely determined by surface appearance is by a study of the pile formation or the way in which the hair of the animal was laid on by nature. This can be seen in the arrangement of the grain of the leather, that is to say, the hair holes or pores, where the hair has been withdrawn. What makes this determination difficult is the minuteness of the grain — sometimes so small and numerous as almost to defy the unaided human eye. Also, some kinds of finishes, employing pressure on the surface, tend to close up or press together the grain of the skin. Leather finishers are expert in imitating the surface appearance of different kinds of skins. Where hot dies are used for this purpose the grain indications imitated are revealed on close examination by their extreme regularity of marking, something nature never does; together with a slightly hardening effect on the surface. Sheepskin can be distinguished by the way the fibres are laid — differently than any other leather — they are not interlaced but laid more or less parallel.

CHAPTER V

FABRICS—THE RAW MATERIAL

GETTING AT THE MAIN FACTS

During the war period when the United States was conducting ground schools to train young aviators a great deal of uneasiness was sometimes expressed by students because they were not permitted to "feel the air" until they had been given at least three months of ground training. In spite of the cry for more flyers these vigorous young fellows were kept at their school books studying trigonometry, mechanics, navigation — just pure theory. Why not let them get into action?

The answer is that Uncle Sam was profiting by the experience of those who knew thoroughly the war business and what it required. The solving of problems in trigonometry was a far cry from the flying of a plane over the enemy lines, but nevertheless a good part of the success of a bombing raid depended upon the understanding of angles, the effect of gravitation and other principles that are often called "theory."

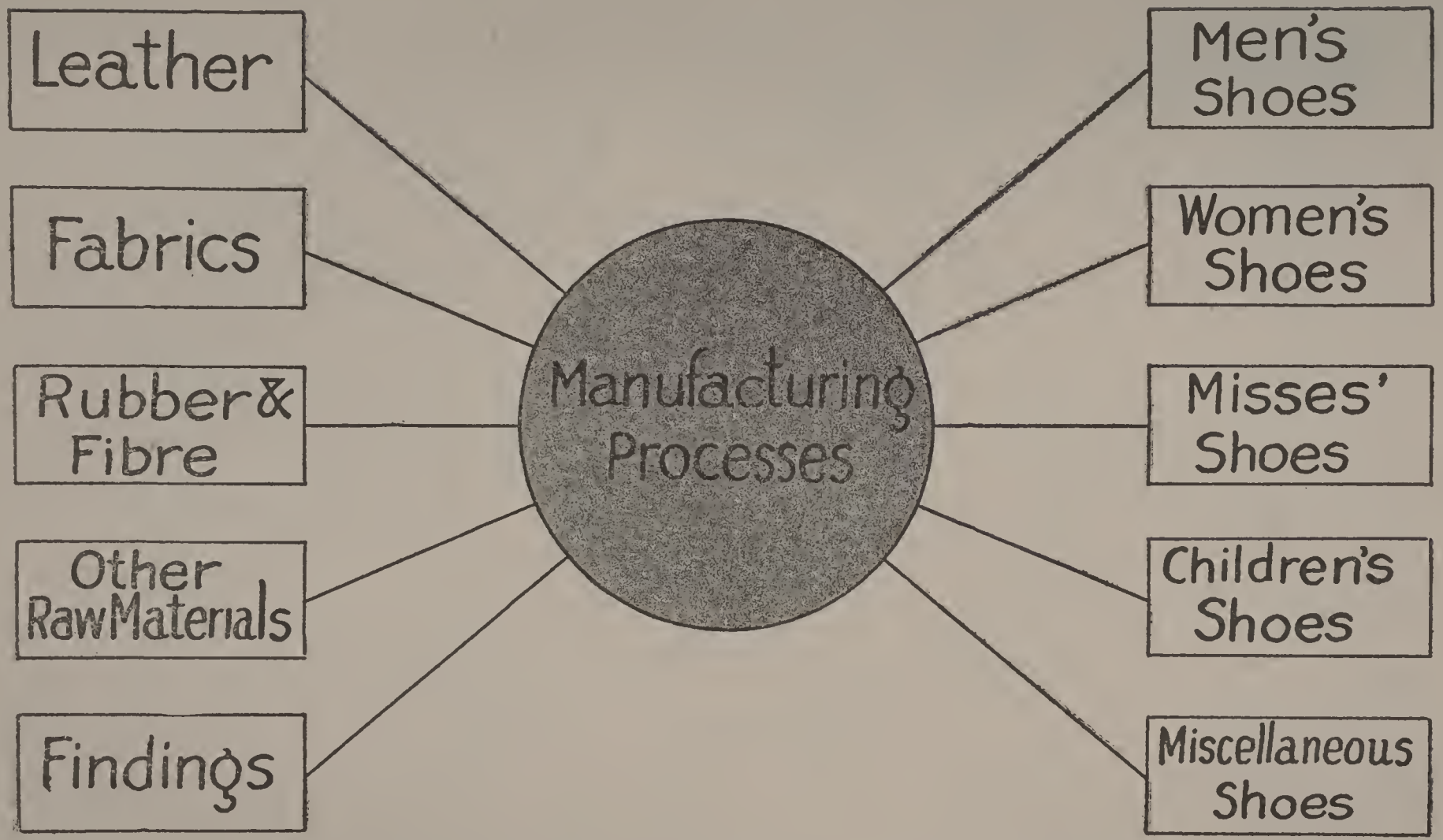
In the same way the shoe salesman is mainly interested to know how to increase his sales and to make more money. He is not a leather

tanner nor a cotton merchant. However, his full success as a salesman is gauged by his knowledge of his product. He must know leather, fabrics and the other materials that make up the shoe. Unless he does he will simply be offering "a pig in a bag" rather than intelligently selling his product on the basis of its merit. Fabrics constitute a most important part of the shoe and it is necessary to know what they are.

IMPORTANCE OF FABRICS IN SHOEMAKING

Since the early stages of shoe making, fabrics in some form have been used. The sandals of ancient China and India were of silk or some other fabric. And as civilization moved westward we find Egypt, Rome, France, England and the United States using cloth shoes and slippers. The steady improvement that has been going on year after year in the development of better textile processes has resulted to produce very highly desirable fabrics for shoe purposes. It is now estimated that about twenty per cent of the standard shoes and oxfords are made with cloth tops and vamps. In view of the fact that there is the great element of style, comfort and durability in these fabrics there is reason to believe that the percentage used in the future will continue to increase.

In the making of shoe linings, for example, cotton fabrics are used almost exclusively because there can be little question that they are



RELATION OF RAW MATERIALS TO THE FINISHED SHOE

the most suitable. Cloth is used to good advantage as a backing for light leathers, to prevent stretching and to give that firmness that makes for better results in maintaining the shape of the shoe.

COTTON

CLASSES OF COTTON FIBRES

The use of cotton fabrics in shoe making has been growing rapidly in recent years. The development of finer grades of twill, canvas and other cotton cloths has led to their very great use as materials for shoe uppers, as well as in white and colored fabric shoes. At the same time cotton materials continue to be used for lining almost to the exclusion of all other materials.

The chief characteristics that determine the value of cotton fibres are their length, strength, color and fineness. The two best grades of cotton are those known in the trade as Sea Island and Egyptian. There is in reality a still finer grade of cotton known as Sakallarides, but the quantity of this available is so small in comparison with the whole cotton crop that usually it is not mentioned in any general classification. The fibre of Sakallarides cotton is fine in texture, of a brownish tint and measures from 1 7/16 inches up to 2 1/2 inches in a very few instances.

Sea Island cotton is of fine, white, silk-like appearance and has the long fibres so desirable in the making of threads and fabrics. The length of the fibre averages from $1\frac{1}{2}$ inches to $1\frac{3}{4}$ inches. It is fine and silky and the cloths made from it are the fine cotton fabrics, such as the higher grades of dress materials, outside cloth for oxfords and the finest white cloth top-materials for shoes. Because of the fact that the staple is long the fibre can be spun into fine threads and yarn and still be very strong. In this connection it is interesting to note that some of the best white cotton shoe fabric material will stand a bursting stress of 600 pounds to the square inch. This is greater than the strength of the best leathers of the same thickness.

A lower grade in the range of quality is the *peeler* cotton. This is the best of those produced to any extent in the United States and has a fibre varying in length from 1 1/8 inches to 1 5/16 or 1 7/16 inches in the extreme. A still lower grade is that known as *upland* cotton. This comes principally from the upland regions of the southern states and particularly from Georgia, Alabama, Mississippi, Louisiana and Texas. American cottons constitute a large and very important part of the world's supply. A safe estimate is that they represent something more than six-tenths of the total quantity produced all over the world. The upland cotton has a staple or fibre varying from $\frac{3}{4}$ to $1\frac{1}{4}$ inches.

It is used in making the great quantities of cotton fabrics for general purposes. Ginghams, sheetings and the medium grades of shoe linings and canvas and duck shoe materials are some of its products.

TESTING AND GRADING

Although the Sea Island cotton has been referred to as the best and the Egyptian as second, there are certain exceptions to the general standard. Naturally, a great deal depends upon the care given to the crop, the condition of the soil, weather conditions and the like. No two crops of Sea Island or any other kind of cotton can be identical in every particular. Indeed it may often be that certain of the Sea Island cottons may be lower in grade than the American upland cotton. It is necessary, therefore, that individual consignments be carefully tested and graded.

Cotton is bought and sold according to the length of the staple and the grade of the cotton. For instance, if the standard grade of cotton of seven-eighths inch staple is worth, say, thirty cents a pound, cotton of one and one-quarter inch staple might be worth about fifty cents a pound, depending, of course, upon the amount that might be readily available at the time and also the extent of current demand for it.

In the cotton brokers' offices experts known as *classers* or *testers* will take samples of cotton

from a consignment; pull them out into smaller samples to determine the length of the staple and its quality. A good tester is able to tell at a glance within one-sixteenth of an inch the length of the staple of a particular sample.

The next test for determining the value standard of the cotton is that of grading. There are eight grades recognized on the New Orleans cotton exchange, as follows:

Fair
Middling Fair
Strict Middling
Middling
Low Middling
Good Ordinary
Strict Ordinary
Ordinary

It is evident that in determining the value standard on the basis of small samples chosen at random there is bound to be something of chance or speculation involved. Assuming that all testers are expert there can be no assurance that the samples represent truly the condition of the entire bulk. It may be poorer in one case and better in another. Then too, there is the chance of a mistake in judgment. All things considered, however, it is to be wondered at that such a tremendous trading can be carried on smoothly in spite of the limitations.

THE MANUFACTURING PROCESS

Manufacturers buy cotton according to grade, staple, tensile strength, etc., and then blend different grades so as to get the desired effect at the lowest consistent cost for raw material. The manufacturing of cotton fabric is, in principle, a simple process. However, in modern practice it has been divided up into many separate processes in order to get the advantages resulting from simple unit operations.

The first operation is that of opening up the cotton as it comes in the bale and then of running it through a machine known as a *picker* which cleans out dust, weeds and other foreign matter. After the completion of this process the cotton comes out in a sheet or *lap*. At this stage the cotton is in loose form resembling sheets of cotton batting. Following this are two processes known as the *intermediate* and *finisher pickers*, the purpose of which is to loosen the fibres still more and to clean out more of the dirt and weeds.

Continuing in the process are two operations known as *carding* and *combing*. The main purpose of both of these is to remove the last traces of foreign matter and the very short fibres and also to get the remaining fibres to lay parallel. The carding machine operates so that the lap or loose sheet of cotton is passed between two moving surfaces from which extend a great many

sharp wire teeth. These catch into the cotton and produce the double effect of cleaning it and of evenly arranging the fibres. As it comes from the machine the cotton is in the form of a round, soft rope of cotton about three-quarters of an inch in diameter. This is called a *sliver*.

For some grades of cloth it is necessary to repeat the process of carding in order to produce a cleaner and finer yarn. For the very finest grades of cloth, however, there is an additional process known as *combing*. In effect this is much the same as the carding; the point of difference being that it is a much more thorough process.

Preparatory to weaving the fibres are next given a treatment known as *drawing*. Several slivers are fed through succeeding rollers of the drawing machine. Each following roller in the series revolves at a higher rate of speed than the one preceding, and as a result the cotton is loosened and drawn out. At the same time the slivers themselves are made to revolve so as to give enough twist to hold them together during the drawing out process. Two or three similar machines in turn continue the drawing and twisting. The last of these winds the cotton on a special type of spool, called a *bobbin*. It is then ready for the final spinning into yarn. At the next step the cotton is drawn out to the required degree of fineness and the required num-

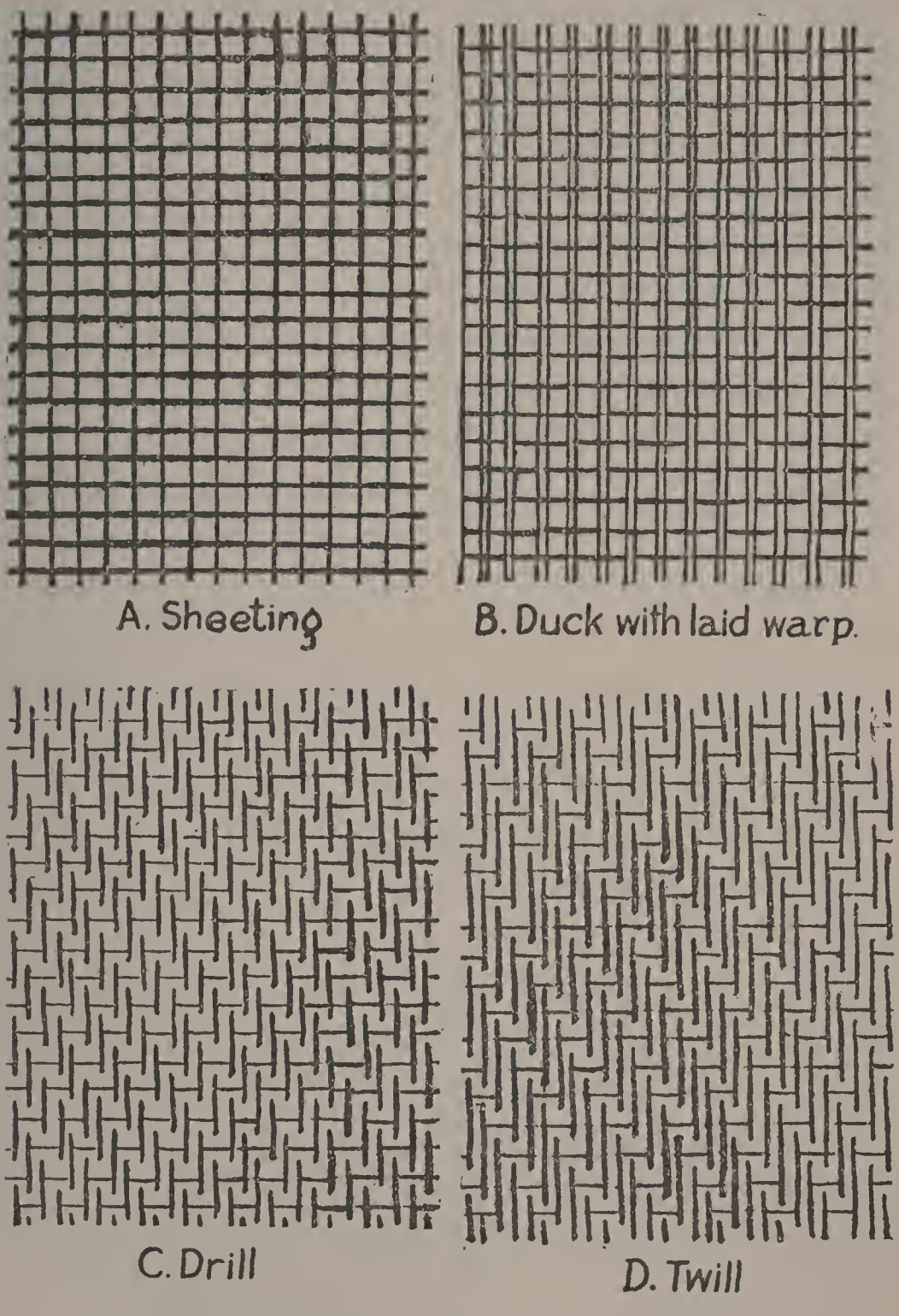
ber of twists to the inch, according to the needs for different grades of cloth.

Different kinds of fabrics require threads or yarns of one size and construction for the *warp*, which is the yarn that runs lengthwise with the cloth, and a yarn or different construction for those that run crosswise. These yarns are known as the *weft* or *filling*. The necessary requirements of size and construction are all provided for in the spinning processes, which have been described.

WEAVING

Finally we have the actual weaving of the cloth. There are many types of looms each producing a different type of weave. The simplest is that known as the *plain weave* and consists merely of alternate cross yarns over and under each other in regular fashion. This is similar to the weave found in the ordinary market basket made of flat strips of wood. The effect of this is shown in the first figure of those illustrating the different constructions of cotton goods.

Figure B illustrates what is known as a *duck*. This differs from the sheeting in that the warp is made up of two threads or yarns laid together side by side, whereas the filling consists of a single yarn. This is known as a *laid* warp. Thus the filling passes over two threads at a time instead of the single thread as in the construc-



WEAVE CONSTRUCTOIN OF FABRICS

tion of the sheeting. Another type of duck is that in which the warp and filling are made up of yarns consisting of two or more threads that have first been twisted together before being woven into cloth.

Another type of weave is that known as a *drill.* This is made on what is called a box loom, having two sets of cross or filling threads so manipulated that the warp thread lays alternately under one filling thread and over two filling threads. The result is to form a diagonal weave such as that shown in Figure C.

Figure D illustrates a twill; in this case a *three leaf* twill. It will be noticed here that the warp is arranged alternately under one filling thread and over three. A four leaf twill would be one in which the warp was arranged under one filling thread and over four. The effect is to produce a more pronounced diagonal grain or pattern in the fabric.

Still another type of weave for shoe fabrics is that known as the *sateen weave.* In this the warp thread is arranged in an irregular series under one filling thread and over several, generally from five to seven. The effect of this is to produce a glossy surface. There are certain modifications of sateen weave introduced to bring out this satin surface in the form of a pattern. This is done on what is known as a *jacquard* machine. The method is employed to produce figured patterns, such as those found in

brocaded silks. For use in fancy shoes and slippers there is a very general demand for brocaded silks and for similar effects in cotton.

Plain weave fabrics are occasionally found in which the figures have been added by an embroidery process. This may be produced either by an operation during the weaving, or by an embroidery machine after the material has been woven. Designs in shoe fabrics are also produced by embossing, in much the same way that designs are stamped on leather, book covers and the like.

DYEING PROCESS

A great quantity of the fabrics produced are required to be dyed in order to make them suitable for the uses to which they are to be put. Dressmaking materials, of course, are called for in every conceivable color. So also with fabrics for fancy pumps, slippers, cloth uppers and the like, where a variety of shades is needed. Generally it is customary to apply the color to the yarn before the fabric is woven or to the woven cloth in piece form. A third method is that of dyeing the fibre before it is spun into yarn but this process does not have as wide usage as the other two.

There is required a high degree of technical skill in properly dyeing fabrics; also a knowledge of the chemical action that takes place in different kinds of fabrics. However, the basic idea

is easily explained. Between the fabric and the dye used there is a natural attraction and as a result when they are placed together under the proper conditions a combination of the two takes place. The process is one of first mixing the dye in water and then of placing the cloth in the liquid. After the cloth has become thoroughly saturated it is removed from the bath, the water is removed by drying and the coloring matter remains fixed in the cloth.

Although this is a statement of what the process of dyeing fabrics really is, the actual work of doing it is not so simple. There is first the necessity of selecting the form of treatment adaptable to the kind of dye used and the fabric to be treated. Then there are the succeeding stages of thoroughly washing the fabric before dyeing, of getting it in condition to take the color, then of saturation in the dye bath and finally a rinsing in clear water before drying. Refinements and variations of this order will often be used but the general idea is stated.

SELECTION OF DYE-STUFFS

An important feature of dyeing is that only those dye-stuffs be used that have a strong attraction for the fabric to be dyed. For example, a particular dye might have an attraction for cotton fibre but not for wool or silk fibre. In that case it could be used with success in dyeing cotton cloth but not for those of wool or silk.

Likewise a certain dye might be more strongly attracted by the moisture of the foot or by rain water than by the fabric itself. In this case it is evident that the cloth would fade when subjected to such moisture and that it would therefore be unsuitable for use as a shoe fabric or any similar purpose. This is simply a suggestion of some of the problems the chemist must meet in preparing dyes to serve all requirements. In using certain kinds of dyes it is necessary to apply what is known as a mordant, for the purpose of getting the dye to hold more permanently. The principle is the same as that of applying the mordant in tanning leather, as previously described.

BLEACHING

Many fabrics to be used as parts of the shoe are required to be bleached. Some of them serve the purpose in the unbleached condition as they come from the loom, but others, especially the exterior fabrics, must be either dyed or bleached; sometimes both. Briefly stated, the bleaching process is one of subjecting the fabric to oxygen gas which attacks the coloring matter and destroys it.

The old method was to spread the fabric on the grass and allow the oxygen in the air to perform its work slowly. This was very effective but too slow for most practical purposes; for a

thorough bleaching weeks were required. Today most bleaching is done with chemicals.

Chloride of lime and sulphurous acid are among the most important of these. With the use of chloride of lime the process is one of passing the fabric through successive baths which apply the bleaching agents and wash the cloth, one after another until the final stages of stretching and drying are reached. Strips of cloth several miles in length are often passed through in one operation. Bleaching with sulphurous acid is generally done by exposing the damp fabric or yarn to the gas created by burning sulphur. The same results could be obtained with the use of water saturated with the gas but the former method is more commonly used.

TESTING FABRICS

The amount of wearing service a fabric will give depends mainly upon the type of its construction, its weight and the quality of fibre from which it was made. Different parts of the shoe require different kinds of service in the fabric. For instance, in a lining wearing service would be of first importance while with an interlining, as will be explained later, it is bulk that is most essential. With this in view it is for the manufacturer to determine what he requires of a shoe fabric and then to get the cloth that meets his specifications.

The principal tests are those for tensile strength and bursting stress. The former is gauged by the amount of pull or tension that one inch of the cloth's surface will withstand. This test is made both in the warp and the weft. The bursting stress is gauged by the cloth's resistance against pressure over an area equal to one square inch of surface. A certain grade of fabric, then, might be said to test for tensile strength 81 pounds on the warp, 55 pounds on the weft and 185 pounds bursting stress. On the basis of these figures the manufacturer would be well able to determine the kind of service he might expect from such a cloth.

CHAPTER VI

FABRICS IN THE SHOE

INTERIOR FABRICS — LININGS

LINING AN IMPORTANT PART OF THE SHOE

The importance of lining as a part of the shoe is not generally understood. The wearer, of course, knows practically nothing about it and up to recent years the manufacturer and retailer did not give it the attention it deserved. There has been too much of a tendency to regard the lining as a "trimming" rather than as a factor which plays or should play an important part in the wear, appearance and comfort of the shoe.

Cotton materials as light as four ounces to the square yard were at one time quite generally used for lining purposes. These cloths, in order to give them more body, were loaded with starch to the extent of as much as 50 per cent of their original weight. The result was a fabric that appeared to have considerable substance when first placed in the shoe but as soon as it was subjected to the moisture of the foot the starch softened and as a result the lining prac-

tically melted away. The average lining at present in use is a 7 to 7½ ounce fabric. However, it is now quite generally agreed that a lining, to properly do all the work it should, ought to be considerably heavier and stronger than this; as much as 50 per cent heavier.

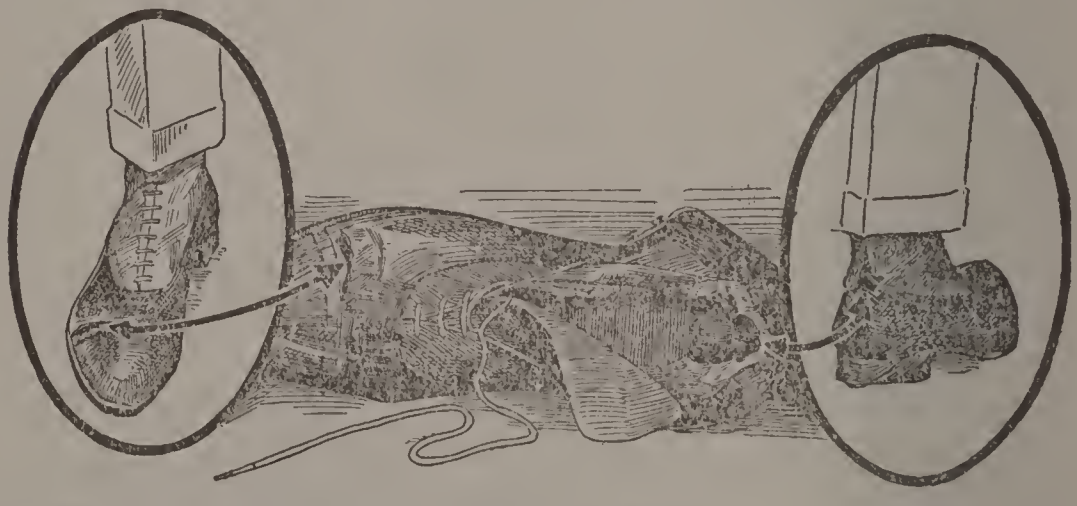
PURPOSE OF THE LINING

The most important functions of a shoe lining are to reinforce the leather and seams of the shoe and to absorb moisture from the foot. In doing this it keeps the shoe in shape longer and adds to its life by preventing premature stretching and breaking of the leather. The actual difference in cost per pair of shoes between the very poorest of linings and that of the very best is only about 12 cents. Between the average lining now used and the best qualities the difference is considerably less than this. Economically therefore it would seem to be a serious mistake to use anything but the best of lining in view of the fact that shoes made with such linings will wear as much as 20 per cent longer than those made with poor linings. Under present conditions this means anywhere from one dollar to three dollars worth more service to the wearer at an extra factory cost of but a few cents per pair.

The use of cheap shoe lining has been a feature of shoe making since the earliest days. For that reason the shoe manufacturer, figuring his

profits in close competition and on a small margin per pair cannot afford to use the best of linings in grades of shoes for which the price standard has already been fixed. Some dealers are therefore finding it desirable to agree to pay the few cents extra necessary to secure the best of lining. In such cases the manufacturer will usually agree to use first quality linings in all shoes for which they are specified.

The illustration [1] below shows the part of the shoe where the wearing strain is greatest. It also points out the results following from the use of an inferior grade of lining fabric.



CONSTRUCTION OF THE FABRIC

There are four different types of fabrics used for shoe lining purposes. These are technically known as sheetings, drills, twills and ducks. The difference in weave of these fabrics has already been explained and illustrated. Sheetings are used only to a limited extent for general shoe lining purposes. Their most common usage as

[1] From an advertisement of Farnsworth, Hoyt Co.

lining is in rubber bottomed sneaks, where a fairly good quality seems to give all the wearing service needed. However, in most types of shoes, sheetings have not tested out as well under the severe strain put upon them in the lining. The drill, twill and duck construction are used very extensively. Bleached drills and twills are used in women's shoes, and in men's shoes either a duck or unbleached twill.

Although the duck has been used perhaps more extensively than the drill in men's shoes, careful experiments have proved that the drill construction is better for the purpose. A comparison of equal weights of cloth in a duck and a drill shows that the latter will give better wearing service. This is due to the fact that the warp threads, of which there are a great many more to the square inch than there are filling threads, are drawn on the surface of the fabric in such a way as to receive practically all of the wear. The filling threads, being less densely woven, naturally do not present as good a wearing surface but they are protected from most of the wear in the case of a twill. However, in a duck they must share the wear equally with the warp threads and as soon as the filling wears through the fabric is useless despite the fact that the warp threads may still be capable of much more service. Another point of advantage in favor of the drill is that it permits the foot to slip into the shoe more readily.

STRENGTH OF THE LINING FABRIC

Generally shoe linings have been made with the filling yarn or threads much weaker than those of the warp. This is a decided disadvantage because any fabric, like a chain, is no stronger than its weakest link. It is particularly true of fabrics used for shoe lining purposes for the reason that the strain on the shoe lining is about equally distributed on warp and filling. The average lining fabric will stand a breaking test of about 110 pounds on the warp, while the filling seldom runs more than 75 pounds. To supply the extra strength and wear that will insure maximum reinforcement of the leather and satisfactory service, certain better grades of fabric are now being extensively used that have a breaking strength of about 150 pounds on the warp and the same on the filling. This presents equal resistance to the strain from both directions. Such a fabric should wear twice as long as the best of shoe lining materials previously used.

PLUMPING CLOTH

In some cases it is necessary to provide a backing for the leather to serve as a means of giving the necessary firmness where fine, delicate skins are used for upper stock. This gives the strength to prevent the leather from stretching in the shoe. The process is one of cementing

a piece of cotton cloth to the back of the leather before it is cut. For the purpose a cotton sheeting is generally employed, although other weaves are used to a small extent. This plumping cloth is supplied with a coating of cement, generally either rubber or gutta percha, so that when it is backed to a piece of leather and heat is applied the two become firmly attached. The combination can then be cut and used in the shoe in the same way that other upper leather is used.

Another method of using plumping cloth is to cut it into strips and to paste these to the back of the leather only at those places where the foot strain is to be the greatest. In this case the leather is reinforced although it is not given any degree of additional substance or body. Pasted on the inner side of leather used in the vamp, plumping cloth serves a very good use to relieve the strain and to prevent stretching. For example, that part of the vamp at the ball of the foot is subject to a heavy strain, especially when the wearer stands in one position for a considerable time. A reinforcement of plumping cloth takes a great deal of this strain from the lining and serves to prevent "bagging" of the leather so often seen in poorly made shoes.

INTERLINING

The *interlining* is used between the lining and the leather to give the necessary feeling of fullness in those cases where lighter weights

of leather stock are used. For the purpose of interlining it is customary to use almost exclusively what is known as cotton flannel. This is simply a cotton lining fabric that has been subjected to a process of napping. This is done by the use of a machine having a great many small metal hooks which catch into the cloth and pull out the fibres so as to produce the effect of a wool surface. Such a fabric is entirely suitable for interlining, however, because it is body rather than strength that is essentially required.

TOP FACINGS

A *top facing* is a strip of leather or cloth sewn around the inner part of the shoe at the top. While sheep skin is very commonly used in women's shoes and in the better grades for men, cloth is also employed quite extensively, particularly in women's shoes. In the better grades of shoes a satin facing is generally used and in the cheaper grades a mercerized cotton, known as sateen. The satin is made with a silk face and cotton back while the sateen is a cotton fabric highly finished to give it lustre. It is on this facing that the name of the shoemaker or dealer is usually stamped, printed or woven. Not a great deal of strength or wearing quality is required in a top facing. The main purpose is to give the shoe a more finished appearance.

INSIDE STAY

Seam stays or reinforcements are generally made of cotton sheeting or drill that has been thoroughly *sized* or stiffened with starch or some other like substance to give it body. The better grades of stays are cut on the bias so that they will lay flat when sewn along the rounded edges of the inside of the shoe. As the purpose of these stays is to reinforce the seam and as they are not visible in the shoe the only requirement is that the material be strong enough to serve the need. A good quality of sheeting or drill, properly sized to give the necessary stiffness, is all that is required.

It will be noticed that in a great many shoes the inside heel stay is now made of heavy cotton webbing which replaces the leather heel stay that was used almost exclusively up to within a few years ago. The reason is that this high grade fabric has been developed and has been found to give equal wearing service to that of leather, and in some cases even better service. The point of importance is that although the fabric may be used to replace leather there is not any reduction in the wearing quality offered.

BINDINGS

Because of the fact that material used as a binding or facing shows on the inside of the shoe it is, of course, desirable that a better looking fabric be used than in the case of the inside stays

that do not show. Certain of these facings are made of silk or silk and cotton. Others are made in worsted, which is a smooth finished wool fabric.

In cotton some of the best grades of bindings are made from Sea Island yarns that have been *mercerized* and *singed*. The mercerizing produces a lustre resembling silk and the singeing process removes the short ends of fibres so as to leave a smooth surface. Sometimes a polished cotton is used. This is made of a high grade Sea Island or Egyptian yarn, and as the name implies, it is actually polished. The polishing is done by the adding of a special lustre starch and then by running the fabric between rollers so that the friction will produce a polish. The result is to give a sheen that adds to the beauty of the finished article. Sometimes the yarn is polished before being woven into a fabric. The process then is varied in that after the starch solution has been applied the yarn is passed over brushes which operate to produce the desired polish.

Succeeding cheaper grades of bindings are made from coarser cottons and without the polish, singeing or mercerizing, depending upon the grade of shoe for which they are to be used.

PULL STRAPS

Material used to make pull straps is made much in the same way as that for bindings.

What is required is a good substantial piece of tape that will stand the strain made upon it in drawing the shoe on the foot. A heavy sheeting or drill weave generally serves the purpose.

EXTERIOR FABRICS — BACKED CLOTHS

A COMBINATION OF TWO FABRICS

Cloths to be used as outer shoe fabrics are often required to be backed by other fabrics in order that they may be given more firmness and body that will enable them to hold their shape in the shoe. Silks, satins, woolen and cotton cloths are all backed to make them suitable for those uses where added firmness or thickness is needed.

For example, let us consider the preparation of a cloth for canvas shoes. This is really a combination of two fabrics. The face of the material is a duck, somewhat similar in construction but of finer quality than that already described as being used for linings. It is generally made of a better grade of cotton fibre, is heavier and is bleached white or dyed in tans, slate, etc. The fabric used for the backing is usually a heavy cotton drill or sheeting. The two cloths are stuck together by means of either a form of flour paste or tissues of rubber cement or gutta percha. The combining process is known as *backing*. This consists of passing the two cloths over steam heated rollers which furnish the heat

necessary to dry the paste or fuse the cement; thus securely fastening the fabrics together.

By this process of backing it is possible to produce a fabric that has the necessary weight and strength for canvas shoe purposes, at a cost considerably less than that of duck woven to the same weight. In fact there is greater strength in the combined fabric than there would be in a single weave cloth of the same weight. Also the former is not so bulky.

METHODS OF BACKING

A cloth backed with the use of paste has excellent wearing qualities. In addition it is porous; thus permitting ready air circulation for the foot. On the other hand, it is not as soft and pliable as cloth backed with the use of gutta percha or rubber cement.

The use of gutta percha tissue as an adhesive substance makes a fine appearing fabric that is strong and flexible. The opinion has sometimes been expressed that gutta percha does not have the lasting qualities of either the flour paste or rubber cement. However, there has been a variety of experience in the use of adhesives so that it is not possible to set down any hard and fast rules on this point.

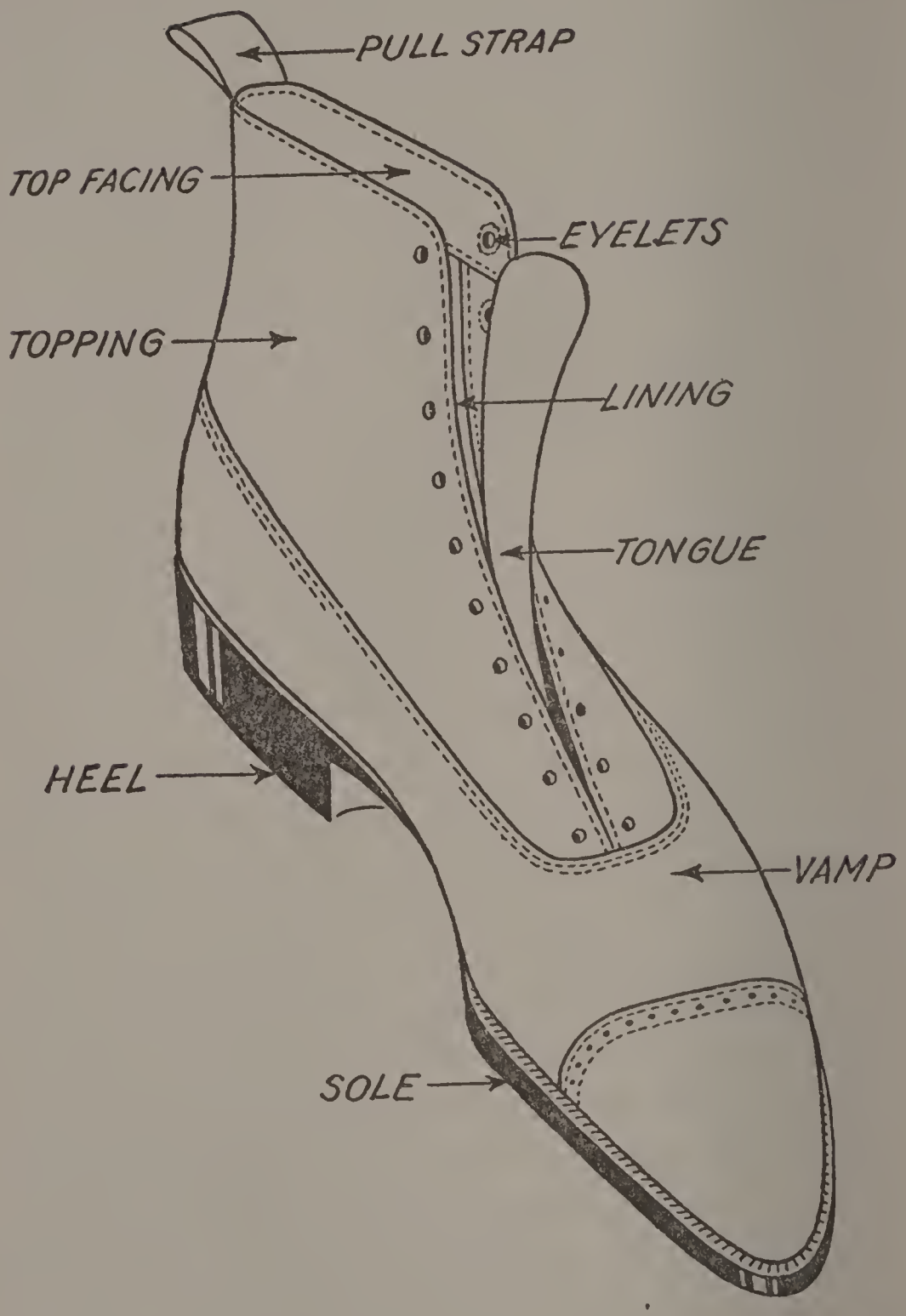
Excellent results are obtained by the use of rubber cement for this purpose as it serves to produce a flexible and fine-looking fabric that will last. The chief point of disadvantage is

that unless the cement is applied with very great care and skill the rubber will have a tendency to make the cloth non-porous and to that extent less desirable for shoemaking purposes. However, there has recently been made great advancement in the processes and skill of backing fabrics and it is now possible, even with the use of a rubber cement, to produce a cloth that is porous. Some idea of the strength of this cement may be had from the fact that certain of the backed cloths are guaranteed to remain cemented for a period of two years. There are other qualities, of course, that range down the scale to those that bear no guarantee at all.

CARE OF THE FABRIC

From what has been said concerning the paste and cement methods of backing cloths, the shoe salesman is in a position to understand why it is necessary that special care be taken in the use of cloth covered shoes. For example, if the cloth used has been processed with a flour paste it is clear that continued cleaning of the shoe by soaking with water would be fatal. The paste would eventually dissolve, the cloths would become separated and the shoe would be ruined. There would be the same danger in exposing the shoe to the rain.

On the other hand, with a cloth on which rubber cement had been used, frequent attempts to clean the shoe with gasolene would be ruin-



SOME SHOE PARTS ILLUSTRATED

ous. In this case the gasolene would dissolve the rubber, the adhesive substance would be lost and, as in the other instance, the cloths would become separated. The method of cleaning the shoe, therefore, would be to use gasolene or some other such cleanser in the first instance and a water solution where rubber in any form is used.

TOPPING CLOTHS

CORKSCREW AND PLAIN WEAVES

In the making of cloth uppers for women's shoes a fabric of diagonal weave known as a *corkscrew* is now used very extensively. This is a cloth that has been developed especially for shoe making purposes. The weave is very fine and of twill construction. Corkscrew cloth used for uppers in the medium grade shoes is usually made with a woolen face and a cotton back. In the high grades an all-wool fabric known as a worsted is used. The corkscrew weave is also made of cotton in both warp and filling. This is used most extensively as an outside fabric in the making of white and colored oxfords.

Cloth uppers for men's shoes are generally made of smooth-faced woolen cloths with a short-nap surface. This is to be distinguished from the twill or corkscrew type of cloth used for women's shoes.

COTTON SEWING THREADS

SERVICE AN IMPORTANT FEATURE

Every shoe salesman realizes that stitching is an extremely important feature of shoe making and that it has much to do with the comfort, appearance and durability of the shoe. Yet very few people know much about the threads used in footwear.

In many cases shoe manufacturers have based their estimates on price and appearance, and have given too little thought to the matter of comfort and durability. The shoe is useless if it does not hold together, no matter how fine its appearance when leaving the factory. For that reason it is well to consider the durability of the stitching thread, entirely aside from other requirements. There are times when footwear style will dictate the use of a specific material or when it may be necessary to select materials to meet a price. However, from the standpoint of true service, it is the quality of a shoe, and not style or price that should be the chief consideration.

Just as any other vegetable varies in quality, depending upon methods of cultivation, climatic conditions, soil and the like, so the cotton plant varies. The selection of different grades of cotton to be used in making thread depends upon the quality and characteristics desired in the

OUTLINE SHOWING PORTIONS OF A SHOE
WHERE SEWING AND STITCHING
THREAD IS USED IN THE
UPPER AND SOLE

finished article. Most cotton thread used in shoes is made from yarns spun from Sea Island, Egyptian, or long-staple Delta cotton.

PREPARING THE YARN

Up to the point of preparing the yarn the process of manufacture is much the same as that already described in connection with the making of cotton fabrics. There are the succeeding stages of opening the bales, untangling the cotton, cleaning and combing until finally the cotton emerges, properly drawn and twisted, in the form of single yarn.

A single thread yarn measuring 840 yards to the pound is known as a No. 1 yarn. If twice 840 yards to the pound, it is a No. 2 yarn and so on. Therefore, a No. 10 yarn would be one measuring 8,400 yards to the pound. The single yarn, however, is never used as a sewing thread. It is twisted together with another single thread yarn of the same size to make a two ply thread or with two others to make a three ply, with three others to make a four ply, and so forth. If, for example, a 30–3 cord thread were to be made, three strands of No. 30 single yarn would be twisted together into one thread. This would contain in yardage per pound 30 times 840 yards divided by the number of ply, which in this instance is three. The length of a pound of this thread therefore would be 8,400 yards.

MAKING THE THREAD

In twisting the single yarn together, the correct number of turns to the inch is required in order to get the desired strength and smoothness and especially freedom from "kinks" caused by too hard twist. The thread may be twisted either to the right or to the left. However, most needle threads for machine use are left twist.

From the twisting bobbins, the gray or unbleached thread is reeled in skeins. At this point a thorough inspection is given to it for the purpose of detecting any faults that would impair its stitching qualities. The next process is that of dyeing or bleaching, according to the individual requirements.

The final and most important step of all is that of finishing. Although the mechanical operations of finishing are the same among all thread manufacturers, there is a difference in the finishing dressings used. Each manufacturer has his own private formulas or recipes for preparing these dressings to meet the requirements of threads for various stitching purposes. Essentially the dressing is one of coconut oil, or some other softening oil, certain waxes and starch.

The purpose of finishing is to polish and lubricate the thread, principally with the idea to create on it a surface that will withstand the friction caused by repeated drawing back and

forth of the thread in the eye of the needle. Some idea of this strain and frictional wear may be had from the fact that in some machine sewing operations on shoes the thread in the eye of the needle passes back and forth through the material from fifty to seventy-five times, depending upon the thickness of the leather sewn and the number of stitches made to the inch.

After the finishing processes have been completed the thread is rewound onto cones, tubes or spools; then labeled and packed for shipment. Winding is one of the most exacting operations through which the thread passes, especially when wound on spools. Because of the extra pressure and the additional draft or strain on thread when so wound, manufacturers are urging their customers to use thread on tubes instead of on spools. The special advantages of this are the following.

1. The cost is considerably less.
2. The tension or draft on the thread when being wound on tubes or cones is less — consequently greater elasticity is insured to the customer when thread is wound on a tube.
3. In tube-winding the guides are of polished steel and therefore they do not have any tendency to cut or scrape the thread as is the case in the spool-winding operation.

The most satisfactory of all cotton sewing threads are those made from the best quality

Sea Island yarns or even a still better grade known as Sakellarides. A four-cord thread would be used for men's shoes and a three or four cord for the lighter weights of leather as used in women's shoes. The size of the thread, of course, depends upon the weight of the fabric or leather in the shoe, and the general style and purpose of the footwear being made.

SUMMARY OF MANUFACTURE

From the foregoing we may sum up briefly the various steps necessary to the manufacture of a good sewing thread:

1. Selection of cotton of the required quality.
2. Spinning and twisting the thread as free as possible from imperfections.
3. Carefully dyeing and bleaching to prevent weakening of the thread.
4. Tested methods of finishing that will accomplish the results desired for different kinds of shoe stitching.
5. Making up for the market in a package that will serve to retain in the thread all of its natural qualities and elasticity; thus reducing thread breaks to the minimum and eliminating knots and imperfect shoe stitching.

MERITS OF COTTON THREAD

For the reason that silk, linen and cotton threads are used in shoe stitching, it is well to

consider briefly the relative merits of these different threads.

In shoes, silk thread is used chiefly to produce a finer appearance in the finished article. Linen thread is rarely used excepting for stitching on the soles. Cotton is used in all shoe-stitching operations, including sole stitching. In fact, it is used in about 80 per cent of the total of all seams in shoes. A great deal of controversy has centered around the relative merits of sewing threads of different kinds. By far the greater number of shoe manufacturers use cotton threads on the bulk of their output. On the other hand, there are others who favor the use of silk and of linen.

This may be said, however, without prejudice, that cotton as a sewing thread for shoes has very excellent working qualities. In stitching machines it can be worked smoothly and consequently with fewer breaks and delays to production. Because of its great durability and because it withstands friction so well it is not likely to rip in the seams. Furthermore, it is the most economical of all threads.

Due to improved methods of finishing in the past few years, cotton threads are now made in mercerized and silk finish so that in certain cases when these have been stitched into a shoe parallel with silk thread, even experts have found it difficult to distinguish the mercerized cotton from the real silk.

LINEN

LINEN ONCE THE FOREMOST TEXTILE

The use of linen in the manufacture of cloth and twine has been known to man for more than four thousand years. Even in prehistoric times the cave-dweller who was accustomed to hunt for his dinner armed with a big boulder as ammunition, knew how to raise flax and how to weave it. This was probably long before he conceived the idea of the use of metals; but he understood the weaving of linen fabrics. Indeed he made them so well that there are remnants of them still existing today.

For centuries Egypt was foremost in the production of linen. In fact there was little competition until late in the fifteenth century. Then it was that Europe took hold and production increased by leaps and bounds. Some idea of the importance of linen as a fabric may be had from the fact that it was the most generally used textile until inventions made cotton fabrics cheap, not much more than one hundred years ago. Since then linen has fallen back into fourth place in point of annual production. It is now preceded by cotton, wool and hemp; named in order of their importance.

PRESENT SOURCES OF SUPPLY

Russia is the largest contributor to the world's present supply of linen. Egypt produces con-

siderable quantities as do also certain of the European countries, such as Holland, Ireland, France and Italy, but these rank only second in importance to the quantity supplied by Russia.

After the flax has been grown it is necessary to pull the stalks from the ground and then to rot away the woody substance on the outside of the stalk in order to get at the linen fibre underneath. These fibres, which average in length about twenty inches, are then combed to rid them of all foreign matter. After the completion of a series of processes, which have for their purpose to separate the best fibres, the yarn is ready for spinning and weaving in much the same manner as that used to make other fabrics.

COMPARISON OF LINEN AND COTTON

Flax does not lend itself so readily to machine treatment in preparing the yarn as does cotton. A great deal of hand labor, first in pulling the stalk from the ground and then in the several operations of freeing the fibres from the stalk is required. All this greatly adds to the cost of the product. In addition there is a much smaller supply of linen available as compared with the supply of cotton.

Because of the greater length of the linen fibre and its firmer construction there is greater tensile strength offered by it than there is in cotton even of the finest grades. It is also smoother, and when made into a fabric takes on

a fine, fresh appearance that improves with continued washing. However, for shoe making purposes the linen cloth is not a factor.

A disadvantage is that linen is not as elastic as cotton and therefore both in the fabric and thread there is not the same flexibility or stretch that there is in cotton. Also, linen is subject to rotting when exposed to changes of wetting and drying, unless close care is given to it.

LINEN SEWING THREAD

In the early stages of shoemaking silk and linen threads were used almost exclusively for sewing and stitching. At present, however, the improvements made in the art of preparing cotton thread have been so great that it is possible to get grades to serve almost every purpose.

Without question, from the standpoint of strength alone linen is superior to cotton. But there is also to be considered the matter of service called for under wearing conditions of the shoe. Some manufacturers believe that the matter of tensile strength is only secondary and that if the thread is not elastic so that it will stretch to conform with the walking movement it is not the most suitable. To meet the objection a special type of stitch has been introduced and by some it is believed that this meets the requirements. The fact remains, however, that the use of cotton for sewing shoe uppers has steadily increased and that the quality of ser-

vice has improved with the advancement in the art of making it.

For stitching the sole of the shoe to the upper it is mainly strength that is desired of the thread and not much stretch. The linen thread, therefore, is well suited and is widely used.

WOOL

QUALITY THE PRODUCT OF CENTURIES

The art of spinning and weaving wool was handed down to the Europeans by the Romans who had acquired a special skill in this branch of work. Great Britain was first among the European peoples to manufacture wool fabrics. However, at the outset her principal success was in sheep raising. As a result, other countries in Europe drew upon Great Britain's supply of raw wool and did their own manufacturing. It was not until many years later that the making of wool fabrics was put on a paying basis in Great Britain, even though it was the seat of the industry in Europe.

Success in making wool textiles depends, of course, to a large extent, upon the quality of the raw wool. Hundreds of years in sheep raising and gradual development of the best grades of wool-producing sheep have all contributed toward making the finer qualities of wool available today.

PREPARING THE FABRIC

The process of preparing wool for spinning and weaving follows along closely to that of preparing cotton fibres. After the sheep have been sheared there are the succeeding operations of grading the wool, of washing and removing dirt and other foreign matter, mixing the fibres according to the kind of cloth to be made, carding, spinning and finally weaving of the cloth.

There are combinations made of wool with other textiles, such as wool and silk and wool and cotton. The former has no usage in making shoe fabrics. However, wool and cotton is often used in uppers for men's and women's shoes. In this combination it is possible to produce a fabric of fine appearance at a considerable reduction in price as compared with the all-wool product. The cotton is woven into the fabric so that it appears on the under side and therefore it is not readily noticeable when the cloth is placed in position in the shoe.

WOOLENS AND WORSTEDS

From the wool fibre there are two classes of cloths made, known as *woolens* and *worsteds*. The chief point of difference between them is that the fibres of the woolen cloth are not made to lie even and parallel but are crossed in all directions and have extended fibres all over the surface of the cloth. A good illustration of this

character of weave is that found in the flannel blanket which shows clearly the arrangement of the fibres.

For the worsted fabric the wool fibres are required to be thoroughly combed so that they will lie parallel and straight. After having been prepared in this way they are then twisted to form the yarn from which the worsted cloth is made. A familiar example of the worsted cloth is the blue serge as used in men's suits, or the corkscrew cloth used in the uppers of women's shoes. These have a firm, smooth surface as distinguished from the "matted" surface of the woolen cloth.

Owing to the nature of these two fabrics it is possible to make woolen cloth from inferior grades of wool and at a lower manufacturing cost because of the fact that, in preparation, the fibres do not need as many combing operations to get them evenly arranged. To make a good worsted cloth requires that the best of wool fibre be used and that they be thoroughly combed, recombed, drawn out and twisted to produce evenness and strength in the finished product.

ALL-WOOL CLOTHS

In addition to the variation of weave construction in wool fabrics there are further variations brought about by mixing different grades of wool fibres. There may, for example, be a mixture of two different qualities of wool such as a high

grade Australian *Botany* wool for the warp and a lower quality wool from a cross-bred animal, for the weft or filler. In this instance it is to be expected that the better quality of wool is so woven that it appears on the face of the cloth. This makes possible an article of finer appearance at a cost considerably lower than that of a cloth made entirely of the higher grade wool.

UNION CLOTH

Another variation is that of a cloth made partly of wool and partly of cotton. The fact has already been mentioned that these are woven in such a way that the wool appears on the surface whereas the cotton is on the under side A cotton backing of this kind serves to add much of firmness, strength and weight. Then too there is the considerable item of saving made possible by replacing wool with cotton. By using two warp yarns of wool (similar to that shown in Figure B of the illustrations of weave construction) and a cotton filling, it is possible to produce a cloth with a wool surface on both face and back. Cloth made in this way has the appearance of an all-wool article but costs considerably less. Also it will give much better wearing service than a grade of all-wool fabric that might be had at the same price as the union.

In making lower priced shoes, manufacturers formerly used, almost exclusively, a lower grade

of all-wool cloth and had it backed by cementing to it a cotton fabric, to add body and strength. However, the later development of weaving the cotton back into the cloth gives the same advantages, and is now being widely used in preference to the backed cloth.

MERITS OF CLOTH FOR SHOEMAKING PURPOSES

Variety is one of the qualities desired in footwear style as in all other articles of wearing apparel. The use of cloth for shoemaking purposes presents a wide field of variety in weave construction, color and pattern effects. The possibilities offered are being more generally understood year by year with the advancement of the art of making cloth to meet every need of the trade.

From the standpoint of cost the shoe fabric has its advantages in that it may be obtained at only a fraction of the current cost of leather. In servicability the best qualities of wool and cotton fabrics rank high with even the best qualities of leather, and they are much better than many of the leathers lower down the scale.

SILK

ROMANCE OF SILK CULTURE

Like so many of the earlier contributions to civilization, the production of silk is to be attributed to China. Just how far back the industry

dates no one knows, although there are evidences that indicate its existence 5,000 years ago.

There seems always to have been a certain fascination to the idea of commercializing the efforts of the busy silk worm in spinning its silken fibre. Practically every country at one time or another has had a "silk craze." In the United States we have had several. California appeared to have ideal conditions of climate, and as a result we had a California silk craze in 1861. But enthusiasm cooled off when it was found that the silk worm required attention. Later attempts have been made to establish the industry; the most recent being among the southern negroes in 1901, but none has had success.

Today the large supplies of silk are those coming from China, Japan and Italy. France was a factor at one time but has since fallen back and is now of little importance.

THE SILK FIBRE

As the silk worm finishes its work and as the manufacturer takes it up, the silk is in the form of a very fine fibre. In appearance this is similar to the fibre of a spider's web; in fact silk fabric has been made from this product of the spider. In the cocoon, as prepared by the worm, there is in the average about four hundred yards of silk fibre in a continuous length. To

make this available for use it is necessary that the fibre be unreeled. This is done by placing the cocoon in warm water to loosen the gum substance that holds the fibres together. It is then possible, after the loose outside fibres have been removed, to fasten upon the main fibre and to unreel its entire length.

The fibre as it comes from the cocoon is so fine and difficult to handle that it is customary to combine three or four of these as they are unreeled and to make one fibre out of them. To make them available for use as yarn or thread a further combination of the fibres is necessary. In a sewing thread, as used in shoes, for example, the number of the original fibres combined will run into the hundreds.

SILK SEWING THREAD

In its raw state the silk fibre is stronger than any other textile fibre of the same size. Although a great deal of this strength is lost in the manufacturing process the finished product, nevertheless, has remarkable tensile strength.

The elasticity of silk is one of its principal points of advantage for use in sewing shoe uppers. As previously mentioned, this is an important feature and must be provided for to insure the best wearing service of the shoe. Another feature in favor of silk is that it takes and retains dye better than any other textile. In silk it is possible to produce a wide variety of

delicate color shades that will not easily fade. In addition there is, of course, the natural lustre which causes silk to be so generally demanded for certain purposes.

Against silk is the fact of its high cost as compared with other threads. This narrows down its usage to those cases where the matter of price is only secondary to service, or in some instances to what may be nothing greater than the pride of possessing a thing that costs more.

SILK SHOE FABRICS

For use in making fancy slippers, pumps, shoe uppers, etc., there is a demand for plain silk and satin fabrics and for special embroidered and brocaded effects. Although a certain amount of wearing quality is required in these it may be put down almost as a general rule that it is appearance principally that the customer demands. Naturally good wearing quality will be expected, but the main consideration is beauty rather than service. The salesman's big talking point, therefore, would be on the subject of appearance.

CHAPTER VII

RUBBER AND FIBRE

ALTERNATIVES FOR LEATHER

The growing scarcity and increasing cost of leather has directed attention to the use of alternatives and substitutes. Leather shoes with cloth tops and canvas shoes of various kinds have been in use for many years. The important modern development is the substitute for sole leather. A number of *combination* soles are on the market. They are usually a compound of fibrous material and a small proportion of rubber.

There has been a variety of experience with these substitutes. Many persons in the trade still cling to the old adage that "there is nothing like leather" while others make the most extravagant claims for the new soles. Experience shows that the truth lies somewhere between the two extremes. At the outset it may be accepted that there is nothing quite as satisfactory as good sole leather. Good fibre soles will have better wearing qualities than poor leather soles, but there are at times considerations other than frictional wear.

Many persons are uncomfortable if the soles of their shoes consist of anything but leather, while others do not seem to be particularly affected. A great deal depends upon the excretions from the feet. Damp feet are hot in summer and cold in winter. The fibre soles do not permit the natural exhalations of the feet to escape, hence the complaints of warm feet in hot weather and cold feet in cold weather. It is generally admitted that good sole leather at a moderate price would drive substitutes from the market, but there is not enough leather to go around. The value of the combination sole is that it supplements the decreasing leather supply.

RUBBER

FIRST EFFORTS TO MAKE RUBBER FOOTWEAR

In the making of footwear rubber has a very necessary part to play. Not only are boots and overshoes made almost entirely of it, but in the manufacture of leather footwear it is utilized for its waterproof and adhesive qualities. Also as a material in making soles and heels its use has increased by leaps and bounds during the last ten years.

The history of rubber has been closely associated with that of footwear. In fact, among our earliest imports of rubber there were included crude types of rubber shoes made by

the South American Indians. These they fashioned on moulds of clay the shape of a human foot, then covered them with layers of rubber, and finally beat out the dried clay after the rubber had become firm. The earlier American merchants sent leather boots to the Amazon, that the natives might coat them with the waterproof gum and then reship the finished product. Overshoes made in this way, however, were far from satisfactory for the reason that they were almost as brittle as glass in winter and nearly as soft and sticky as molasses in summer. Years of investigation spent by Goodyear, the inventor, resulted in his discovery of the process of vulcanizing, as a result of which it became possible to make waterproof footwear that would not be affected by changes of temperature.

THE RAW STATE

Rubber is the product of a number of trees, shrubs and vines, nearly all of which grow in tropical climates. There are more than a hundred kinds and quantities known in commerce, and as many more known to scientists. These vary greatly in their physical properties, and because of this, are used for widely different purposes, by manufacturers. For some uses the particular quality required is hardness, while for others just the opposite; softness and resiliency are essential.

In its raw state, rubber as obtained from the trees and vines, is in liquid form. The larger portion is obtained by *tapping,* which means that cuts are made through the bark of the trees; allowing the milky liquid to drip into cups placed in position to receive it.

DRYING AND CURING

The liquid, called *latex,* is collected from the cups, then subjected to a process to convert it from the liquid to the solid form. This is done in a variety of ways. For example, South American rubber from the Hevea tree is treated by smoking and made into large balls known as *biscuits*. A paddle is dipped into the rubber liquid, then held in the smoke of a fire of palm nuts. This dries and *cures* the layer of latex, much the same as smoke cures pork. The paddle is dipped for layer after layer, or the latex is poured over it, until a biscuit one or two feet in diameter is produced. This is then split in two to remove the paddle.

Other methods of performing this process of drying and curing are also in use. The most scientific, however, is that used in the preparation of Plantation rubber from the East Indies. acetic acid or some vegetable liquid containing a similar acid is placed with the latex in shallow pans. The rubber then rises to the surface in thin sheets, light yellow in color. These are

dried, pressed tightly together and packed in cases for export. Sometimes the sheets are smoked before being packed.

Brazil at one time produced nearly all the rubber used for manufacturing purposes; its annual output was between 30,000 and 40,000 tons. Twenty years ago Africa produced about 20,000 tons and Asia 2,000 tons. Brazilian *Hevea* trees were introduced into the East Indies about the first of the present century and now the annual product of these plantations form the main part of the world's production; the 1918 figures were more than 250,000 tons. Brazil still produces about 35,000 tons, and Africa only about a tenth of its maximum.

CLEANING

Plantation rubber does not require washing because the process by which it is first treated removes all dirt and other foreign matter. However, other rubbers do require to be cleaned in order to prepare them for use in manufacturing. The treatment is first to cut the rubber into small pieces and then to soften these in vats of hot water. They are then run between corrugated rollers which crush and tear the rubber while water flowing over it removes the dirt and grit. It is finally rolled out into thin sheets, which are either hung in a drying loft or placed in a vacuum drier. The former process requires several weeks, the latter only two or three hours.

PREPARING FOR COMMERCIAL USE

Rubber in its pure state is of comparatively little service. Other substances must be mixed with it in order to make it serve the variety of purposes for which it is employed. An elastic band must stretch and return to its original shape and length. It must also be soft. An automobile tire must be tough and firm whereas a comb must be stiff and hard, in order to serve its purpose.

One very important treatment is that of vulcanizing. This results in the changing of rubber into a practically new material. It is accomplished by mixing sulphur with the crude rubber and submitting it, under pressure, to the action of heat. Other treatments are also given to produce special qualities such as strength, resilience and resistance against the action of water, oil and air. The necessary substances are thoroughly mixed or compounded with the rubber after it has been made soft, like dough, by passing it between steam heated rollers. Finally it is run into long sheets and is ready for use. Up to this point the process of preparing rubber is much the same regardless of the kind of article to be made from it. The manufacture of rubber boots and overshoes will be treated in a later section of the Course. Here we are mainly interested in rubber as one of the materials in shoes.

RUBBER HEELS

During the past few years rubber heels have come into very general use, mainly because they serve to prevent the excessive nerve jar caused in walking by the continual impact of the leather heel on the hard city pavements. Another advantage is that they permit of noiseless walking. It is claimed that over 75,000,000 pairs of rubber heels were made and worn in the United States in 1918.

For this purpose the rubber must have a reasonable amount of resiliency and sufficient toughness to resist undue wear. The heel must have some means of fastening to the shoe without in any way interfering with the resiliency. It is clear that the method of fastening a leather heel would not do for a rubber one, for the reason that the nails at the surface would be both hard and noisy. The usual method is to imbed in the rubber heel metal washers or plates through which nails are driven into the heel-seat of the shoe. The heads of the nails are thus held by the washers well beyond the wearing surface of the heel.

MAKING THE HEEL

Up to the point of preparing the rubber in sheets the process is the same in making rubber heels as it is for any other purpose. However, these sheets as at first prepared are required to

be further rolled into sheets one-half the thickness of the intended heel. Dies the shape of the heel then cut pieces from these sheets. Washers or plates are placed in position upon one heel piece and a second piece is placed on top, thus making a heel of the required thickness with the washers in-between. They are then placed in steam heated metal moulds which may be engraved to form a design upon the finished heel. Several such moulds, each containing a number of heels, are placed under heavy pressure, steam is turned on and the rubber is thus vulcanized. Any excess of rubber which may be forced out by the pressure is trimmed off with scissors, after which the heels are ready for the market.

MEANS TO PREVENT SLIPPING

One great defect of rubber heels has been their tendency to slip upon smooth, wet surfaces. This difficulty is being overcome in various ways by different manufacturers. One way is to form cavities in the tread of the heel so that in walking a vacuum is produced by the pressure on the heel. The size, shape and number of such cavities varies with the different makes of heels. Other makers insert plugs of different shapes and sizes. These are made by coating cotton duck with rubber and rolling spirally. These rolls are cut into thin slices or discs and inserted in the tread surface. In action the canvas absorbs the moisture and swells a little, sufficient to hold

the heel firmly to the ground and thus to prevent skidding.

In shoe making rubber also has an important use as one of the materials in cement. However, this will be treated in a following chapter under the heading of cement.

FIBRE

SOLES

Soles of rubber are used to some extent but by far the larger proportion of those used as substitutes for leather are made of rubber and fibre. The principle is the same as that of the rubber heel with a combination of cotton fibre, as already described. The sole has the anti-slip quality of the mixed rubber and fibre, although, as used for this purpose, fibre is added principally to increase durability.

HOW THE SOLE IS MADE

The term "fibre" as used here includes a variety of different materials. Leather scraps are torn in shreds and then compressed in combination with a rubber compound and vulcanized. It may be prepared in sheet form from which the soles are afterwards cut out in the required shapes and sizes, or the sole may be vulcanized in a mould after it has been cut. In the combination sole the fibre holds the rubber, gives

a tougher surface, prevent cracking and because of its absorptive powers, prevents slipping.

Cotton fibre ground from rags or waste thread or fabric is used for the same purpose. Wool fibre and waste wool is loosely felted and thoroughly mixed with rubber and similarly used. The cuttings from coated fabrics used in tire and footwear manufacture are ground and mixed together and form the material for some makes of combination soles. Reclaimed or regenerated rubber is said by a noted chemist to be particularly valuable for this purpose. He states that the use of such rubber in a compound increases its serviceability.

Cork, ground to a coarse powder, has been used with fairly satisfactory results as a filler for non-slip soles. The ginned cotton seed retains a fibre that has been utilized for this purpose. Some mineral substances have been tried, but with the possible exception of asbestos, have been found impracticable. Cotton, wool and leather are all good. The longer the natural fibre the better it can be felted and the more successfully the soles can be stitched without splitting; also the better are their wearing qualities.

TESTING

Fibre soles have in many cases proven more durable than even good quality leather soles. They are not today considered merely as economical substitutes, though they could be fur-

nished on the basis of 1919 market prices, at much lower cost than good leather. A fibre sole should be flexible and not too heavy. A test for quality is to fold it upon itself and to press the fold sharply. Under this treatment it should show no signs of cracking and should quickly return to its original shape. A more thorough and severe test is that of cutting a slit part-way through with a sharp knife and then to press the cut open by bending. A good sole should show no tendency to extend the cut made in this way.

FIBRE COUNTERS

As with so many other shoe parts, counters originally were made almost always of leather. Within recent years, due largely to the great increase in the cost of leather, there has been a continually greater use for this purpose of fibre and *leather board*. The latter is an imitation of leather made from scraps of leather pasted and pressed together into sheets. At the present time the largest percentage of counters used are those made of fibre; mainly from hemp fibres. Some also are made of indurated fibre, which is a paper pulp saturated with a metallic chloride, and moulded to shape.

HEMP FIBRE

Hemp being the longest and strongest of all vegetable fibres is particularly well suited for the making of counters. The largest quantities

of hemp are grown in Russia, which, under normal conditions, produced more than a billion pounds annually. This quantity is about two-thirds of the world's yearly crop. The Philippine Islands and certain of the United States also contribute in smaller quantities.

After the hemp is cut the first process of treatment is that of rotting it. This is a process much like that of rotting flax; the object being to rot out the gum substances and hold together the plant filaments and thus to loosen the hemp fibres. It is in this form that hemp is received for manufacturing purposes.

HEMP COUNTERS

The preliminary stages of preparing the hemp for use need not be reviewed at length. In the usual order there are the processes of separating the fibres and freeing them of outside matter as already described in referring to cotton fibre. The final treatment before moulding is that of preparing the hemp in sheet form. These are passed through large machines that mould the counter, under great pressure, into the required shapes. It is then made ready for use as part of the shoe.

There are many features essential to the making of a good counter. One of the most important is that it should have a wide *scarf*. The scarf is the beveled edge at the top of the counter and its purpose is to provide the required

thickness in different portions so as to make the counter conform easily to the shape of the shoe and thus to prevent wrinkles on the outside leather.

If the counter is not beveled down to a very thin edge the line of the counter will show through on the outside of the shoe. This is particularly true in the case of fancy shoes. Another important feature is that the counter should be flexible at the upper part and rigid at the lower part. Between the two extremes there should be varying grades of flexibility; increasing toward the upper part of the counter. This helps toward conforming it to the shape of the shoe and is especially necessary in the cheaper grades of poorly tanned colored leather, where an imperfect fitting would so readily show through the shoe.

Still another feature is that the counter should have a rigid back at the heel seam in order to hold its shape. It should be carefully fitted so that it will conform to the last and the lower portion should be uniform in strength around the entire heel seat.

In addition to the matter of lower cost there are some advantages of the fibre counter over those made of leather. The former has not increased in cost in proportion to the cost of leather. It is not affected by moisture from the foot nor by outside moisture. It is very resilient and thus permanently retains its shape. It is

also much more uniform in quality than leather, even of the best grades, and vastly more uniform than the cheap grades, such as those used in making counters.

CHAPTER VIII

OTHER RAW MATERIALS AND THEIR USES

WOOD

THE SHANK

Although wood in various forms is used in shoes, its greatest use by far is in the making of the *last* to form or mould the shoe in manufacturing. In the finished shoe, wood is found very generally in what is known as the *shank*. This is a reinforcement used to stiffen the sole at the arch between the heel and the ball of the foot. This support may be either wood or steel, or it may be wood reinforced by steel. Michigan maple of the best quality is commonly used, although any hard wood of sufficient strength and elasticity will serve the purpose.

WOODEN HEELS

Heels are quite often made of wood and covered with leather. This is particularly true in the case of high heels and spool heels for women's shoes. This wood also is oftentimes of maple but still other selected varieties find general usage. The blocks are worked up into the

desired shapes and sizes by automatic machinery in much the same way that lasts are made. It is evident, of course, that wood is cheaper than leather; it is also somewhat lighter, but the successful making and attaching of wood heels requires a higher grade of skillful workmanship than that required for the same class of work on leather heels.

WOODEN SOLES

In certain kinds of work, such as that in breweries, powder mills, at soda fountains, and the like, wooden soles are used quite extensively. They are also used much more generally in foreign countries, particularly in Holland and Germany, where a large percentage of the peasants wear cheap brogan shoes with wooden soles. This wood for soles is a selected grade of hard wood. The soles are cut and shaped by an automatic machine process. An interesting point to note in this connection is that in order to prevent flat foot, wooden soles are made with rocker bottoms so that the wearer can rock on the bottom and get a motion similar to that made in ordinary walking with flexible leather sole shoes.

PEGS AND PEG WOOD

In shoemaking the peg serves the same general purpose as the steel shoe nail; namely, as a means of attaching the shoe sole and heel and

also to a limited extent, as a means to prolong the life of the leather. Individual pegs are little used at the present time, except by occasional country cobblers, and then only for making heavy work shoes. Peg wood, however, is considerably used in connection with the Davy pegging machine, which is an automatic means for cutting and driving the peg.

CUTTING AND FINISHING THE WOOD

The wood for pegs must be of the best quality of beechwood. Companies manufacturing pegs send men through their forests to select those trees that are practically free from knots and other irregularities in the grain of the wood.

In making peg wood the logs are sawed into sections or layers about an inch thick so that from these the peg of the proper length may be cut. Then a revolving saw, working around the block, cuts it into what is really a ribbon or coil of peg wood. One end of this coil is sharpened to a point such as is required in the finished peg. These coils can be fitted into the Davy pegging machine which cuts off each peg as it is driven into a shoe. Peg wood, of course, is provided in various lengths and thicknesses so as to furnish pegs of various sizes. A No. 8 peg wood, for instance, is one of which eight pegs, set side by side, would extend an inch. Similarly, Nos. 10, 12, 14 and 16 peg woods are graded. In coarse shoes generally Nos. 8

and 10 peg wood is used. In fine shoes it is more common to use a No. 12 or 14 peg.

USE IN SPECIAL KINDS OF WORK

One of the uses of peg wood is in heavy work shoes. Whenever a shoe is used in places where nails would be dangerous, because of the attraction of electricity, as, for instance, in a powder factory, pegged shoes are required. Logging boots are frequently made with an extra sole or tap which is pegged on. In army work also, the engineering corps uses a shoe with a similar tap pegged on.

Within the last few years pegs have been used some in attaching the top lift of the heel. In the first instance this was simply a novelty, some people thinking it was more decorative than the shoe with the top lift of the heel fastened on with wire nails. But it does offer certain advantages.

Pegged shoes which were extensively worn in the last century have now nearly disappeared, except for special needs; they were never so small a factor as now. Wooden shoe pegs were originally calendared and compressed to prevent swelling by moisture after being driven. The pegging machine, to drive wooden pegs, was one of the earliest machines used in shoemaking at the beginning of the present era of machine-made shoes, covering a period of successive development and improvement of about seventy

years. The pegged shoe had its day and passed on before economic laws.

IRON AND STEEL

THE SHANK

A common use of iron and steel is in connection with the making of the shank. As previously mentioned, the shank is frequently of either wood or steel, or a combination of the two. Steel is really the better material for this purpose. It has more flexibility and is thus able to conform more readily to the walking motion. It yields with the arch when the weight of the body is placed upon it, but after the pressure is removed it again springs back into the original shape. Arch supports are made in varying lengths, widths, and shapes. Some are made to hold up or support a broken arch as well as to give it the desired flexibility for correct walking. Others are provided for those cases where only a simple brace is required. These are generally narrower in design and are attached to the wood and leather-board before being placed in position as part of the shoe.

Among other iron and steel products used in shoes there are nails and standard screws, lacing hooks, heel and sole rims and plates, also hob nails and a great variety of other small plates that are either fastened on by nails or screwed

to the sole and heel to prevent wearing and to conserve leather.

MANUFACTURE OF SHOE NAILS

Nails for shoemaking are made from what is known as *tack plate*. In the steel trade a sheet of steel more than a quarter of an inch thick is called *plate* and it is from such sheets as these, rolled especially for the making of tacks, that shoemaking tacks are manufactured. The main requirement is that the steel shall have a small amount of carbon, say, 12/100 to 20/100 of one per cent so that the tacks will be soft enough to withstand pounding without breaking and at the same time hard enough to drive through the leather without buckling.

The tacks are cut from this tack plate very rapidly and in large quantities by means of automatic machinery. Machines for this purpose have been improved to a high point of perfection. The plate is cut into strips prepared for the purpose by ridding the surface of hardening. It is then put in process in an automatic machine which forms the nails or tacks.

VARIETY OF USES

In a *welt* shoe tacks are used in three places, first for tacking the innersole to the upper; second, for attaching the heel and third for attaching the top lift to the heel. A *welt* shoe is one in the manufacture of which the machines prin-

cipally used are those of the "Goodyear" patent; named after the inventor of the process. The product is known as a *Goodyear welt* shoe. This process will be described fully in the section of the Course on Shoemaking.

It is desirable that these nails, commonly called *slugs* should be rather soft so that they will wear down with the leather rather than to protrude above the level of the heel in such a way as to cause damage to floors, and also to increase the possibility of slipping when walking on hard, smooth surfaces.

In the *McKay* process, which is another method of shoemaking named after the inventor, the nails are used to attach the innersole to the upper and lining. These are left in the shoe after it is completed. The nails are cut from the same kind of tack plate as are those used in the Goodyear process.

For heavy work shoes and for army shoes hob nails are required. The main purpose of these is to prolong the wearing life of the shoe. They are also serviceable to prevent slipping in soft substances underfoot, such as muddy ground, etc. Hob nails also are cut from tack plate but of a higher carbon content so that the nail is a much harder one than that used for ordinary purposes. It is, of course, desirable in this case that the nails should not wear away.

Various other types of nails and tacks are used in shoemaking for special purposes but in general

the processes of making are the same as those already described; the different purposes for which they are used determining the hardness of the tack plate required.

PAPER

SHANKS, INNERSOLES, LIFTS, ETC.

The use of paper in its ordinary form is of but little importance in the manufacture of shoes. However, for indoor shoes, where the matter of wearing qualities is not the primary consideration, paper is used to some extent. In the making of the innersole it is of some considerable use; sometimes reinforced by sheep skin or by thin pieces of other leather. Compressed paper in the form of a thin board and various other composition boards in which some paper may be found, are used quite extensively in the shanks of shoes. They also find use to form the middle *lifts,* or layers of leathers, in the heels of cheap shoes. In both of these places paper board is considered satisfactory because it will give good wear as long as the rest of the shoe lasts. At the same time it makes possible the selling of the shoe at a lower price and the conserving of leather for other parts of the shoe for which it is more necessary.

Paper covers are used as a protection to white shoes and some fancy leathers and fabrics while in process of manufacture, to prevent soiling or

other injury. Specially prepared paper is employed for this purpose; a strong waterproof paper of Japanese production being very good.

CORK

INSOLE AND FILLER

Due to the fact that it is practically waterproof, cork finds use in a variety of forms in shoemaking. It is used frequently in the form of sheet cork of a thickness varying from 1/16 to 3/16 of an inch and is applied between the outside and innersole as a means to make the shoe waterproof. It is also used as a *filler* in certain kinds of shoes. This filler is a combination of cork shavings and pitch and is used to fill in the space left when the upper leather is lapped over at the sole. By the use of this filling a level and solid surface is provided for the sole. Cork is the lightest substance obtainable for this purpose. It is also easily applied and makes a soft substance under the foot. This combination of cork and pitch serves to give flexibility and at the same time prevents the possibility of squeaking. Because of its waterproof qualities, cork is very serviceable in the case of light weight shoes. If it were not for this filling the dampness of the wet street would work through the light sole and thus subject the foot to moisture.

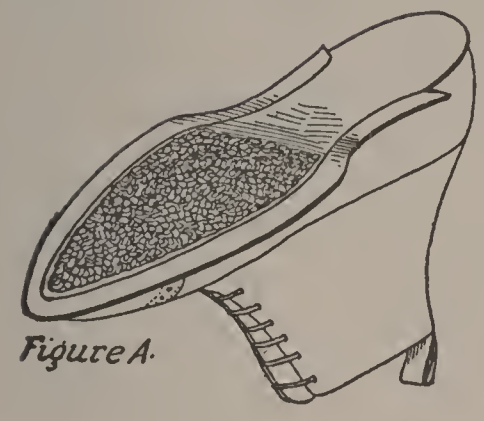


Figure A.

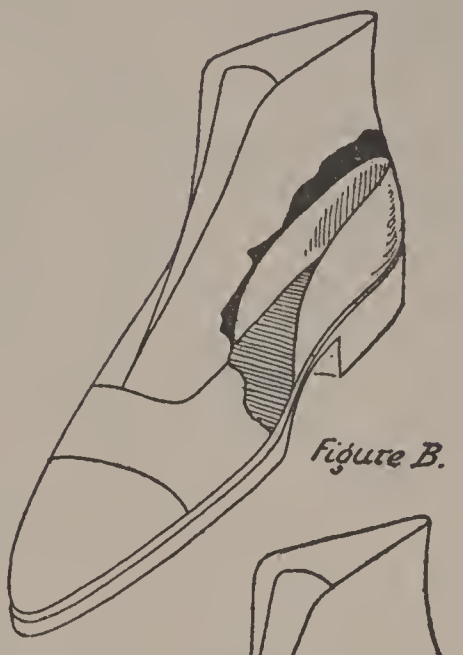


Figure B.

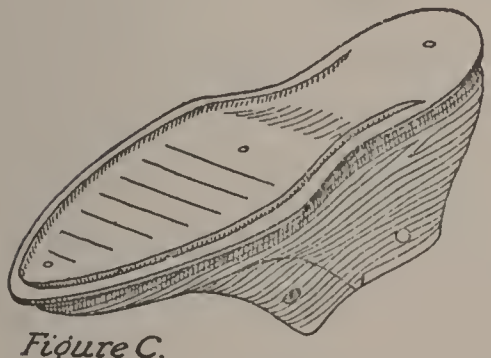


Figure C.

Figure D.

FIGURE A. Illustrates the use of cork filler and its position in the shoe.

FIGURE B. Illustrates the shoe with a portion of the upper leather cut away to show the Counter.

FIGURE C. Shows the innersole on the last before the upper leather is attached.

FIGURE D. Illustrates the shoe with a portion of the upper leather cut away to show the Box Toe.

ARTIFICIAL LEATHER

ESSENTIALLY A VEGETABLE PRODUCT

Artificial leather is made principally of vegetable products. The process is one of applying a coat of enamel on a heavy cotton drill or sheeting. The coating is mainly of linseed oil mixed with turpentine and certain solid substances. Lampblack is also used to give the required color.

The Du Pont company has a brand known as "Fabrikoid" which is developed really as a by-product of the company's ordinary manufacturing operations. The material from which this is made is a cellulose substance and comes as a by-product in connection with the making of explosives. Within recent years the quality of artificial leather in general has been much improved so that it will now retain the appearance of leather. This is a necessary qualification for the use it has had in certain parts of the moderate priced shoe. The fact is, however, that in the past artificial leathers have failed when subjected to constant bending. On the other hand the present artificial products are a great step forward in the ages-old endeavor to provide a substitute for the natural article.

USE IN THE SHOE

It is used with fairly good results as material for the shoe *tongue,* which is the strip extend-

ing beneath the lacing. It is also satisfactory for making *quarters;* a part of the shoe upper extending vertically along the back to reinforce the heel.

Success has been had in using artificial leather as material for making the uppers of dancing slippers; particularly in silver and gold. With the increasing price of leather and of cotton and woolen fabrics, it is likely that the use of artificial leather will increase. This will be true particularly as the quality of the product continues to improve.

COMBINATIONS OF RAW MATERIALS

INNERSOLES

USE OF COMPOSITIONS

Innersoles are made of various materials, the most common of which is leather. It is undoubtedly true that leather makes the best innersole for the same reason that it makes the best outersole. But it is also quite true that in cheaper grades of shoes a satisfactory innersole can be made of fibre or cork or of various composition materials. There are also a number of advantages to these other innersoles. They are, for instance, more uniform in strength and substance so as to prevent any variation in last-

ing or welting and they insure a smooth inside. Many of these substitutes for leather in innersoles have long wearing qualities and will not crack, break, shrink, pull, swell or tear.

POINTS OF ADVANTAGE

It is not necessary to sort these because they are entirely uniform and therefore they add much to the fit and evenness. For instance, it is frequently easier to get a better looking forepart because of this uniformity. Perfect measurements are easier to obtain because of uniformity of the foundation. The inseam can be tighter and there is no danger of cutting the sole stitching on the outersole. Many of these composition innersoles are waterproof and in addition will stand hard usage very well.

One of the great advantages is the saving that results. This frequently amounts to as much as five to ten cents a pair. The disadvantage of the composition innersole is that when the outersole is worn through, the composition produced will give way much more rapidly than leather and before the wearer realizes it the shoe may be beyond repair, except by the addition of a new innersole and a new welt. This would be so expensive a process before resoling as to make it out of the question. Generally if the innersole gives way the customer might as well buy a new pair of shoes.

BOX TOES

MAINLY FELT OR CANVAS

The ready-prepared box toe has come into general acceptance only within the past few years. Formerly they were made of sole leather. However, with the necessity to reduce the use of leather to only the most essential requirements, because of the limited supply, and with the need of scaling down the price of moderate priced shoes, various substitutes have been introduced. The most of them are just as satisfactory as the solid leather box toe. Those made of good canvas or felt meet practically every requirement. They are produced by first cutting out the felt or canvas in the shape of a half-moon. Then the material is treated to a stiffening process until it is firm enough to mould over the toe of the last. Finally it is coated with glue or some other stiffening material which renders it firm and hard as well as practically waterproof.

Some factories make their own box toes of canvas coated with shellac and box-toe gum and these are said to render average good service.

CEMENT

WHAT IT IS

Cement as used in shoemaking is essentially a combination of rubber and gasolene. It is

in reality simply gasolene thickened with rubber. Rubber cement should contain at least the proportion of half a pound of rubber to a gallon of gasolene, with a mixture of such amounts of rosin or similar materials as may be required for the different purposes for which the cement is to be used.

Rubber cement is used in making a shoe because it is the only substance that will adhere permanently to wet leather. It is employed, where possible, to avoid using tacks. Paste or glue could be used if the leather were never subjected to the moisture.

The grades of rubber that are used to make this product are the Brazilian Para and Ceylon rubbers. The difference in the various qualities of cement results from the difference in the quality of rubber and gasolene used in their manufacture and the judgment used in combining them with rosin and other necessary ingredients.

CHANNEL CEMENT

In most processes of attaching the sole a *channel* is required to be cut in the sole. The channel is a slanting cut made around the edge of a sole or insole where the stitching is to be done. The flap thus formed is then folded back and after the sewing is completed it is again cemented down in the original position. If the channel cement is not of good quality it will not hold

down the channel flap. The result is that the flap along the edge of the shoe turns up; exposing the stitching and detracting from the appearance of the shoe. Even though a cheap cement should hold until the shoe is sold there is the likelihood that the action of walking will cause the cement to break after a short time. The channel will then open up and make an unsightly edge to the sole. On the other hand, if the cement is of good quality it will not break and the channel will not open up as a result of usage in wearing.

SOLE-LAYING CEMENT

A second type of cement is that used in sole laying. In shoes made according to the Goodyear welt method, this *sole laying* cement is applied to the sole after the bottom of the shoe has been filled with a mixture called a "filler" as previously described under the subject of cork. The upper side of the sole, which is next to the innersole, is covered with a coating of this cement and the outersole is then made fast to the innersole. The advantage of this cement is twofold. It not only helps to hold the shoe in shape during the process of manufacture but it also adds to the wearing quality of the shoe. A good grade of sole laying cement will prevent the sole of a wet shoe from shrinking. Sometimes, when the sole laying cement does not hold, the edge of the sole

OUTLINE TO SHOW PORTIONS OF A SHOE
WHERE RUBBER CEMENT IS USED

breaks away from the upper portion of the shoe and thus leaves an imperfect edge. In double soles, if the cement is not of good quality, so as to make a perfect union between the inner and outer sole, there is likelihood of friction and a consequent squeak in the shoe.

STITCHING ROOM CEMENT

The purpose of cement used in the stitching room is to hold the edges of the leather firmly and evenly while the stitching is being done. In this respect it serves the same purpose as basting does in the case of dressmaking. Cement is also used to attach the lining of the shoe to the outside leather. The lining and the leather are both coated with cement and then pressed together at the time of stitching.

LEATHER CEMENT

In the cement business all cements used in shoe factories are called rubber cements. So-called *leather cement* is a mixture of gutta percha and bisulphate of carbon. This is only used in shoe repairing as, for example, to paste on a piece of upper leather in making a patch.

CHAPTER IX

SHOE MANUFACTURERS' FINDINGS

SHOE BUTTONS

THE PAPER BUTTON

Shoe buttons are commonly made of paper. Until recently ornamental buttons of celluloid or bone were thought necessary but manufacturers of paper buttons have succeeded in imitating them so well and in obtaining such a good finish that the paper button is now used almost exclusively for shoe purposes. It is, of course, much cheaper than the bone or celluloid button. Furthermore, it seems to work better in button-attaching machines and thus can be more cheaply and quickly attached than other buttons. This is probably due to the fact that it is moulded rather than cut, and therefore more uniform in shape and size.

THE MAKING PROCESS

The paper pulp for the button is run through a machine which by means of steel dies cuts out the rough button. This is then pressed into shape and at the same time the eye of the button is

driven in and clinched. The buttons are then saturated with oil and baked or oxidized so as to make them very hard. This baking process is repeated two or three times until the desired firmness is obtained. The buttons are then enameled. The enamel is applied and baked on, one coat after another, until an enameled surface of the desired quality is obtained. Each coat of enamel requires baking until it is thoroughly hardened.

Finally the buttons are tested for the strength of the eyelet. In a good button it is required that the eyelet shall stand a "pull" or tensile strength of sixty pounds or more.

Various special shapes and sizes of buttons are made. In one design that has been put upon the market recently, the under part of the button rolls from the eye outward, thus making the bottom more nearly in the shape of a sphere. When this button is attached to the shoe it serves to relieve the strain on the button hole and reduces the possibility of breaking it when the shoe is unbuttoned carelessly.

EYELETS

TWO STYLES OF EYELETS

In general there are two main classes of eyelets; visible and invisible. As the name indicates, visible eyelets are those that show on the outside of the shoe. The invisible, or blind

eyelets, are those that are fastened in the shoe between the facing and the lining so that no part of the metallic eyelet is visible on the outside of the shoe.

Most shoes are fitted with the visible type. The invisible eyelet is not so durable nor so easy to apply. Its use is for the purpose of adding to the attractiveness of a high grade shoe. Invisible eyelets should never be used in the case of the cheaper grades of leather or fabric shoes for the reason that the cheaper leather or fabric is likely to fray out because it does not have the extra reinforcing that the outside eyelet provides.

VISIBLE EYELETS — FAST COLOR

The best grade of visible eyelets and the kind that is today very generally used in the best and medium grade shoes for men and women is that known as *fast color*. It is provided with a top of a solid-color material so that it cannot turn brassy in wear, as do eyelets made by the ordinary enamel process.

In manufacturing this particular kind of eyelet, the barrel, or that part which is set or pressed against the leather of the shoe to hold the eyelet in place is made of brass and has a small flange turned at one end to form the top of the eyelet. This metal is then nickel plated in order that there may be no corrosion of the eyelet when subjected to the moisture of the foot.

The top, which is the part that shows on the surface when placed in the shoe, is made of celluloid which is moulded around the flange of the barrel so that it is held very securely in place. The celluloid is supplied in black, white and the variety of colors required by the shoe trade.

When fast color eyelets were first introduced they immediately became popular, and shoe dealers were able promptly to distinguish them from the ordinary enamel eyelet, by the nickeled barrel which showed on the inside of the shoe after the eyelet had been set in place. However, an ingenious manufacturer of eyelets found a way by which he could nickel-plate eyelets of his own making so that they imitated the appearance of the genuine article. Just that portion of the top which showed on the surface of the shoe upper was enameled, and thus was secured an imitation of the fast color eyelet, which was impossible to distinguish after the eyelet had been placed in the shoe.

While there was considerable confusion in the trade for a time, the manufacturers of fast color eyelets promptly met the situation by having a small, diamond-shaped trade mark slightly raised on the top of each eyelet made by them. This new distinguishing feature and the reason for it were widely advertised not only to the retail dealers in shoes, but to the wearers as well, and the possibility of further substitution was thus prevented.

ENAMEL EYELETS

The enamel eyelet is a type of the visible variety. As may be inferred from the name, it is covered with a coating of enamel over the metallic background. Enamel eyelets are made in various qualities which depend upon the number of enamel coats given them in the making. The cheaper grades have only two or three coats, while the better grades have as many as eight or ten coats. Enamel eyelets cannot be considered absolutely fast for the reason that it is possible, with continuous use, to wear through the enamel and thus to expose the brass. However, they are generally considered suitable for medium and low priced shoes because a good grade of enamel ought not to wear through to the brass within the lifetime of the shoe. Indeed, a good grade of enamel eyelets should wear considerably longer than the shoe itself.

JAPANNED EYELETS

This is the cheapest grade of the visible eyelets and is suitable only for use in cheap shoes. The eyelets are stamped out of brass or other metal and are then dumped into a can and covered with one coat of ordinary japan, which is a hard, black varnish. Such an eyelet will stand very little wear; in fact, it is quite common for the japanning to break off before the shoe is sold.

INVISIBLE EYELETS

As these are not visible it is not necessary that they be made fast color. It is only necessary that they be of a sufficiently good quality of metal and of workmanship to prevent their pulling out or slipping after they are inserted in the shoe.

LACING HOOKS

BRASS AND STEEL HOOKS

The purpose of the lacing hook, of course, is to supply a convenient means of lacing the shoe; thus taking the place of the eyelet or button. They are made of either brass or steel. Brass hooks are used in bathing shoes and in such other types as are likely to be subjected to water. The reason for this is that the brass will not rust. Steel hooks are made of special steel that will stand drawing out into tubes and will, at the same time, stand the strain of shoe lacing without bending. For that reason great care has to be used in the making of steel for lacing hooks in order to get these two qualities into the same metal. As is the case with eyelets, lacing hooks are divided into three classes.

FAST COLOR LACING HOOKS

In high grade shoes and even in those of medium quality the top of the lacing hook which is visible from the outside of the shoe, should

be fast color. It is made so by adding a cover of celluloid in just the same way that fast-color eyelets are made.

ENAMELED LACING HOOKS

These are made by adding from two or three to eight or ten coats of enamel to the top of the hook (depending upon the quality of the hook desired) and thoroughly baking it on. Under ordinary circumstances, the enameled hook will last longer than the shoe. It is not, however, absolutely fast color as it is possible for the enamel to wear through in the case of a shoe that has had long usage.

JAPANNED HOOKS

The japanned hook is found only in the cheaper grades of shoes. It is made by adding about five or six coats of japanning. This, however, is likely to wear through before the shoe is worn out. In some grades of heavy working shoes, a hook that is plated with nickel or brass is used instead of one that has merely been japanned. As a rule, a plated hook will wear longer than a japanned hook, but even this will generally not wear as long as the shoe.

SHOE DRESSINGS OR CLEANING AGENTS

NEED OF THE DRESSING

The purpose of the shoe dressing is to furnish an attractive appearance to the shoe that

has become mussed up as a result of handling during the process of making. After the various operations of manufacture have been completed it is necessary to go over the shoe and restore its finish wherever it may be found to require it.

In order to make up dressings for the different types of shoes it is necessary to know first of all how the leather was dressed originally. For instance, a shoe made of snuffed calf skin would require an entirely different kind of dressing because the finish of the leather in the first place was different from that of the ordinary calf skin. Therefore, manufacturers are called upon to make up a great variety of dressings, for the reason that the work of dressing the shoe is practically one of re-tanning and re-finishing, as well as one of cleaning. The process is that of going back to the first step in tanning, and the result of good work in dressing the shoe is to restore the leather through this re-finishing to its original condition.

EXTENT OF RE-FINISHING

If in any place the defacing is more than a simple dulling of the leather it will be necessary to go back more than one step in the finishing of the leather according to the condition in which it may be in the particular case. In some instances it may be necessary to go through every process of tanning. However, only one

step generally is necessary and this is the equivalent of the last step in finishing the leather. This is simply a matter of adding a new lustre, and there is an advantage in this work in that it also improves and preserves the leather.

Sometimes the leather shows only a dullness that requires simply rubbing with a dry rag. This dullness, by the way, is likely to appear again after the shoes are on the retailer's shelves. It is therefore a good plan for every salesman to have handy a small polishing cloth with which to rub up the shoe before he presents it to the customer. The matter of a polish on the shoe is small but it will oftentimes have a very decided influence upon the customer.

DRESSINGS FOR DIFFERENT KINDS OF LEATHER

A snuffed leather that has been ruffled up will require that a filler be used. These fillers are made of a variety of substances, depending upon the needs of each case. After the filler, a surface dressing must be applied.

Box calf and other glazed leathers require a dressing that will give results without rubbing. Some form of a shellac dressing, so made that it will not injure the shoe, is used for this purpose. Generally the shellac is combined with an alkali in order to stimulate the action upon the leather. This combination is then applied after the filler has been allowed to dry.

With white canvas shoes it is first necessary to clean off the surface dirt with a rubber eraser. Then a canvas dressing, composed of a body of white chalk and a gum, such as benzoin, is applied. This dressing must be very carefully applied so as not to clog the mesh of the canvas. To prevent this clogging the dressing should not contain too heavy a mixing of chalk.

Various kinds of colored shoes, such as tans, require special dressings that are particularly difficult to prepare and use. Gray shoes, for instance, have a tendency to fade and to change color after they have been made up, and in spite of the best tanning it is difficult to restore the finish.

RE-DYEING

Sometimes it is thought desirable to attempt to re-dye leathers and, in fact, whole shoes. But manufacturers and retailers alike have found that no dyes have yet been developed that will give entirely satisfactory results, except black. It is much better to use the leather or the shoe in the color as it is. The difficulty of re-dyeing any color but black is one mainly of getting the surface in condition so that the dye will penetrate evenly. In attempting to re-dye a shoe the problem is to prevent staining of the lining and also to get an even application of the dye in different parts of the shoe and in different thicknesses of leather.

WAXES

For use on heels, shanks and the edges of shoes, waxes are employed as a means of dressing. Generally a mixture of bee's wax and shellac of different compositions is provided, as may be best suited for different purposes.

WATER BLEMISH ON THE SOLE OF THE SHOE

A great many opinions have been advanced concerning the cause of water stains on the soles of shoes. One opinion is that the sole of the shoe, while passing through the factory, may have been subjected to water containing something that would stain it.

Some manufacturers believe that stains on the bottom of the shoe are the result of certain irregularities in the tannage that cause the spotted effect. There is, however, no certainty as to the true cause and therefore there is no positive means that manufacturers can use to entirely prevent water stains. The important point is that the stain does not in any way decrease the wearing quality of the shoe. This has been proved by experiment with a pair of shoes, one of which had water stains while the other was without. Both were found to have equal wearing qualities.

It is well then for the shoe salesman to make no effort to conceal the fact of a water stain but rather to explain frankly the circumstances to

the customer and to bring out clearly that the wearing quality of the shoe will in no way suffer.

FALSE IMPRESSION CONCERNING SHOE DRESSING

There is a very general impression that black or enamel dressings are used only on the soles of shoes of inferior quality, and that this is done in order to cover up certain defects in the sole. That this is without foundation is borne out by the fact that in the very highest grades of black shoes it is quite customary to use a black stain for the bottom. The stain adds slightly to the wearing quality of the sole and in addition keeps it from losing its fresh appearance, as a result of being handled frequently in the store before the final sale.

A sole that is finished in the natural color will more readily become marred in appearance than one that is stained or enameled in black. The black stain is of particular advantage in the case of women's shoes because the first impression, if it be an unfavorable one, may so prejudice the customer as to prevent the sale. With men's shoes the matter of first appearance is not generally of such great importance.

BOWS

HOW BOWS ARE MADE

Bows are used mainly on Colonial pumps as a form of decoration. The best quality of bows are made entirely of silk in both the warp and

the filling. A less expensive grade is made of silk wrap and cotton filling. Still cheaper grades are made entirely of cotton; varying all the way from the best cotton bows in which a fine mercerized Sea Island cotton is used, down to a very cheap bow made of ordinary peeler yarn.

A good quality of bow is provided with a brace or support for the purpose of keeping it in shape. Generally pieces of cloth stiffened with glue, (called buckram) are used for this purpose. One of these supports is attached to the inside of the bow and another at the back of the bow. It is important that a fairly good quality of cloth be used for this purpose. A coarse or honeycombed buckram would not furnish sufficient resistance permanently to hold the bow in shape.

A piece of material, known as a *conformer,* is attached between the two pieces of buckram. The purpose of this is to bring the bow back into shape whenever it is pulled out of position. At the same time the conformer is pliable enough to make it possible to shape the bow to the contour of the shoe and to have it stay in that position.

Bows may be either sewn or riveted together. Riveting is somewhat more economical in manufacturing cost. It also makes a more durable fastening than sewing.

Leather bows are made in exactly the same way as those of cloth are made.

QUALITIES OF BOWS

It is evident that a high grade slipper should have a bow of silk or at least one of silk and cotton. The medium quality shoe should have a bow of silk and cotton or of fine mercerized cotton, while in the case of the low priced shoe it is to be expected that the lower grades of cotton bows will be used. However, there is comparatively such a slight difference in cost between the cheap cotton bows and those of the better grade of mercerized cotton or of silk and cotton construction that the manufacturer is usually justified to use the better grades. The cheap cotton bow is likely to fade or show wear long before the shoe is worn out and to that extent detract from the customer's satisfaction.

Retailers are given the opportunity to replace moderate priced or cheap bows with better grades at a slight additional cost to the customer. A good bow adds to the attractiveness of the shoe and the customer is oftentimes willing to pay an extra 25 or 50 cents for a bow of good quality silk. Incidentally there is a fair margin of added profit in the transaction.

BUCKLES

REQUIREMENTS OF A GOOD BUCKLE

Buckles for shoes are made in innumerable styles and of a great variety of materials. The

important requirement of a good buckle is that it be adapted to the style and size of the shoe, that it be in good taste and made of such material as will last at least as long as the shoe. In a good quality buckle provision is made to have it considerably outwear the normal life of the shoe. The reason for this is to guard against any possibility of the plating wearing through while the shoe is still being used by the customer.

A buckle, to be thoroughly serviceable should conform readily to the shape of the shoe. It should be flexible so as to adjust itself to the movement of walking and it should be light in weight. The edges should be smooth so that they will not cut into the shoe material and the parts should be strongly made so that they will not become detached under ordinary wear.

From a manufacturing standpoint, the buckle should be so made that it may readily be attached with a hand stapling machine.

SHOE LACES

CLASSES OF LACES

Shoe laces are made on what is known as a braiding machine, as distinguished from an ordinary weaving loom such as that used in making cloth. Laces naturally divide themselves into several classes. One classification is that between silk laces and cotton laces. Another is

between cotton laces made of polished yarn and those in which the yarn is mercerized. A third classification is between laces that are made for the shoe manufacturing trade — that is, laces sold to manufacturers — and those that are prepared for the retail store's findings department. A further classification is the all-leather lace which is simply a strip of leather of suitable weight, material and color, cut square or round.

A new type of lace has recently been invented and developed. This consists of a closely woven or braided lace, treated in such a way as to make the finished product resemble leather, yet possessing all the desirable qualities of the braided lace.

DIFFERENT GRADES OF LACES FOR MANUFACTURER AND RETAILER

In this section of the Course we are interested mainly to consider laces that are made for shoe manufacturers; to be inserted in shoes before they are sold to the retailer. In order to keep the price of the shoe down as much as is consistent with good wearing qualities, it is customary to insert in a pair of shoes only a moderate priced lace that would retail for about five cents a pair. Manufacturers require that laces have good appearance and that they be of such quality as to insure wear for several months, under reasonable wearing conditions.

In retail stores it is generally as easy, and

much more profitable, to sell a ten cent lace as it is to sell a five cent lace. It is advisable therefore to provide for the retail trade a higher grade of lace. This is especially true because the higher grade lace will invariably give greater satisfaction to the customer in the long run. These are some of the practical reasons for distinguishing between laces made for the shoe manufacturer and those made for the retail store trade.

It must be added that there are great varieties of grades in manufacturers' laces, varying from the cheap, flimsy lace usually found in the cheap shoe to the high grade cotton, or occasionally silk laces found in the best shoes.

Shoe manufacturers' cotton laces are usually made from a single ply thread of medium staple cotton yarn. The grade of cotton, together with the fineness of the weave determines in a large measure the quality of the lace.

BRAIDING THE LACE

The yarn is first dyed and then polished. These processes are essentially the same as those previously mentioned in referring to cotton fabrics. The polishing process consists in passing the yarn through a sizing of paste or gum arabic and then of running it through a burnishing machine. The result is to give a high lustre to the yarn.

The operation next following is that of wind-

ing the yarn on long spools or bobbins that fit into the braiding machine. After determining the size of the braid and the different degrees of openness or closeness of the weave, the machines are arranged to weave the required number of threads into the braid. For instance, in the lace known in the trade as an 88 thread lace there are 88 separate braided threads.

Each bobbin is unwound from both ends of the yarn. In a very coarse braid there will be 24 threads braided together and this would therefore require the use of twelve bobbins. Very fine braids, particularly those for tubular laces, call for as high as 144 to 200 threads. This would mean the use of 72 to 100 bobbins in braiding.

All laces are tested by manufacturers for their tensile strength. The cheaper laces supplied in shoes will withstand a pulling strain of from 50 to 75 pounds while the better grades will run from 100 to 150 pounds. High grade laces sold by retailers at ten to fifteen cents will frequently stand a strain of 200 pounds or more before breaking.

POLISHED AND MERCERIZED YARNS

Instead of using polished yarn it is often customary to use yarn that is mercerized. A reference to the process of mercerizing has already been made in the section on fabrics. The same process is used in mercerizing the yarn for shoe

laces. Mercerized laces are somewhat stronger than polished laces because the mercerizing has an effect to harden and strengthen the fibre of the cotton.

Both the mercerized and the polished yarn laces are what are known as soft laces. Occasionally a highly glazed lace is used. The disadvantage to this grade is that it does not remain tied as well as the soft laces. The highly glazed lace is made by applying a thick coating of starch to the product after it has been braided. Cotton laces are frequently spoken of as mohair. This is not technically correct because mohair is really a woven hair fabric. However, these cotton laces are often polished so as to give them much the appearance of mohair, and it is due to this fact that they are so called.

CUTTING AND TIPPING

Laces are originally braided in a continuous length and are later cut off to the desired length. The ends of the braid, after being cut are folded back and, in some of the better grades, the tip is made of the fabric itself, and is strengthened by the addition of some substance that will provide a good tip. One of the best methods is that of adding rubber cement to the end of the lace after it has been folded back, and then of rolling this end into a point shaped like a metal tip. The cement hardens and makes a very serviceable tapered end. As there is no metal in this,

there is no possibility of the appearance of brass or tin that results in the use of a metal tip. Furthermore, as it is a part of the lace it cannot pull off.

QUALITIES DESIRED IN A GOOD LACE

The distinguishing qualities of a good shoe lace are interesting to know. First of all the material should be fast color and should have a good lustre. A dull black lace or one faded or streaked detracts very much from the appearance of the shoe and the retailer who finds poor laces in the shoes that he buys is quite justified in discarding the laces and having them replaced with others before offering the shoe to his customer. In fact, it is quite customary in rural sections of the country to have retailers supply, without cost to the customer, a good pair of laces with each pair of shoes sold because of the general impression that the laces that come with the shoes are not likely to last very long.

Laces should be fine enough in weave to retain their shape. A coarse weave lace is more likely to get caught in the eyelets or lacing hooks and thus be easily torn. The shoe salesman, after a little experience, will readily be able to distinguish between various grades of laces by a simple examination of the color and evenness of the dye, the fineness of the weave and of the thread and the quality of the tips. It is clear, of course, that laces should be of uniform length.

In selling laces special care should be used to guard against incorrectly mating-up because of the inconvenience this causes the customer.

STYLES

The styles of laces change frequently. At present the wide, flat lace is not being used generally. Tubular laces are being more widely demanded. This style of lace varies in width from one eighth of an inch to three eighths of an inch. Round, tubular laces are undoubtedly more practical and are likely to remain in general use for a long time.

SILK AND IMITATION SILK

Silk laces are braided on the same kind of machines and in the same manner as are the cotton laces. They are more commonly found in the flat, wide braids than in the flat tubular or round tubular braids. Ordinary silk does not wear as long as good cotton. Imitations of silk are made from wood or other fibre or of highly mercerized cotton of a long staple. Of course, the longer the staple of cotton the more evenly the resulting yarn can be spun and the more tightly it can be woven. For the cheaper grade laces an ordinary upland cotton of about three-quarter inch staple is used. For the higher grades a medium staple or even a long staple cotton, such as Sea Island, may be used.

STYLES OF SHOE CARTON LABELS

CARTONS AND LABELS

IMPORTANCE OF ATTRACTIVE CONTAINERS

Last in the list of manufacturers' findings is the carton in which the shoe is to be delivered to the retailer. Manufacturers generally have come to realize the importance of using an attractive carton. Customers are much impressed by an attractive container, whether it be for a shoe, a hat or a package of breakfast food. On the other hand, the cheap carton, unattractive and fragile as it is, will soon get out of shape and break and as a result will give the customer the impression that the shoes are either cheap shoes or that they have been in stock a long time.

Because of the importance of appearance in the proper selling of the shoe, a label for the front of the carton was finally developed. The idea was put into form about 1880 by a printer named Tolman. Being located in Brockton, Massachusetts, which is one of the centres in the manufacture of men's fine shoes, he was able to enlist the coöperation of a number of the manufacturers and together they developed what formed the basis of the modern shoe label.

DISTINCTIVE APPEARANCE OF THE STOCK

In recent years retailers who buy from various manufacturers have come to the necessity of

using their own distinctive style of cartons and labels in order to get a desirable uniformity and attractiveness in the whole stock when it is assembled on the shelves. Others who buy largely from a single manufacturer, provided that manufacturer supplies attractive cartons have, of course, no necessity for buying special cartons. Still others have their own cartons made up and labeled, and then have these sent to manufacturers to be filled. Another plan is for the retailer to have his own boxes in which to put the shoes that have been received in the manufacturers' boxes.

Whichever method may be followed makes little difference so long as the result is to insure that the shelf boxes are uniform, attractive and in good condition.

For the purpose of illustration samples of box labels are shown. It will be noticed from these that there is no attempt at any general standard of design. Each manufacturer has a distinctively original label which serves to set apart his goods from among all others; thus making them easily recognized on the shelves.

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